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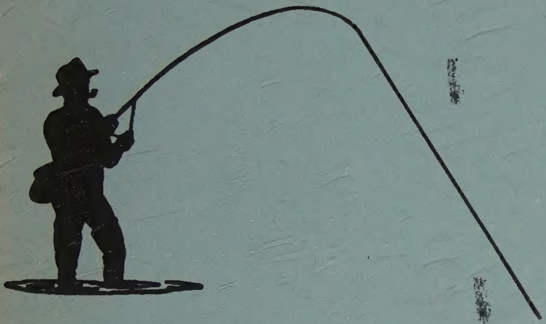

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SPORT FISHERY ABSTRACTS

Vol. 24, No. 4, 1979

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U. S. FISH AND WILDLIFE SERVICE

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SPORT FISHERY ABSTRACTS

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Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

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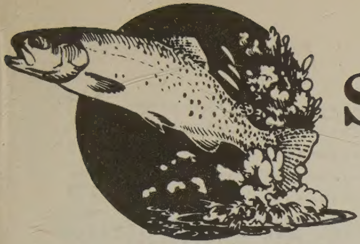

SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 24 Number 4 1979

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AQUATIC PLANTS AND THEIR CONTROL

79-002492 Goeltenboth, F. THE EFFECT OF TWO BIPYRIDYLIUM DERIVATIVES ON THE ROOT TIP MITOSIS OF /EICHHORNIA CRASSIPES/ (MART.) SOLMES.). J. Satya Wacana Res. 1 (4): 345-357. 1978. SFA 24(4)
[Satya Wacana Christian Univ., Salatiga, Indonesia] A gradual decrease of the percentage of mitotically active cells in the root tips of water-hyacinths can be shown with paraquat and diquat as concentration and incubation time are increased. Both herbicides completely inhibit mitosis at 6 ppm for 48 hours. Both interfere with interphase cells entering mitosis and formation of spindles in late prophase. No aberrations of chromosomes or chromatin were observed.

79-002493 Goeltenboth, F. THE EFFECT OF GLYPHOSATE AND AMETRYN ON THE ROOT TIP MITOSIS OF WATERHYACINTH (/EICHHORNIA CRASSIPES/ (MART) SOLMS). J. Satya Wacana Res. 1 (3): 267-281. 1978. SFA 24(4)
[Satya Wacana Christian Univ., Salatiga, Indonesia] Waterhyacinth cells decreased in mitosis as concentrations increased of glyphosate (N-(phosphonomethyl) glycine) and ametryn (4-ethylamino-6-isopropylamino-2- methylthio-1,3,5- triazine. Complete inhibition of mitosis was observed with 50 ppm ametryn and glyphosate in 24 hours, or with 10 ppm ametryn in 48 hours. No abnormalities of chromatin or chromosomes was observed with ametryn and less than 1 percent of cells treated with glyphosate for 96 hours at 0.4 ppm and 1.6 ppm showed abnormalities such as stickiness of chromosomes and fragmentation. Both prevent interphase cells entering mitosis and ametryn disturbs metaphase formation more effectively than glyphosate.

79-002494 Snow, J. R. A TECHNIQUE FOR CONTROLLING WEEDS IN STRIPED BASS REARING PONDS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 322-328. 1977[1979]. SFA 24(4)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL 36830] Simazine (2-chloro-4, 6-bis (ethylamino)-s triazine) applied at a rate of 11.2 kg/ha as a preflooding treatment of striped bass (/Morone saxatilis/ Walbaum) rearing ponds effectively controlled aquatic weed growth for periods of up to 172 days. In untreated ponds, weed species were dominant in 9 of 16 replications (56 percent). Where simazine at a rate of 11.2-14.0 kg/ha was applied to the pond bottom just before flooding, only 3 of 17 replicates (18 percent) supported nuisance aquatic plant species. Survival and growth of striped bass fry and fingerlings was as good or better in the treated ponds as in the untreated ones.

79-002495 Timotius, K. H.; Mulyadi, Y. LEAF-SPOT FUNGI ISOLATED FROM WATER HYACINTH LEAVES IN THE RAWA PENING LAKE, CENTRAL JAVA. J. Satya Wacana Res. 1 (3): 262-266. 1978. SFA 24(4)
[Satya Wacana Christian Univ., Salatiga, Indonesia] /Myrothecium roridum/ Tode ex Fries, /Rhizoctonia solani/ Kuhn, and /Alternaria eichhorniae/ were found and illustrated with photographs. The last species holds most promise as a biological control agent on water hyacinth.

GENERAL FISH CULTURE

79-002496 Ackefors, H.; Rosen, C.-G. FARMING AQUATIC ANIMALS. THE EMERGENCE OF A WORLD-WIDE INDUSTRY WITH PROFOUND ECOLOGICAL CONSEQUENCES. Ambio 8 (4): 132-143. 1979. SFA 24(4)
[Dep. Zool., Univ. Stockholm, Box 6801, S-113 86 Stockholm, Sweden]

79-002497 Inaba, D. [PRESENT STATUS AND FUTURE PROSPECTS OF LARGE SCALE CULTURE AND PROPAGATION OF IMPORTANT AQUATICS IN JAPAN.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 1: 7-12. 1972[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Agric. Vet. Sci., Nihon Univ., Tokyo, Japan]

79-002498 Stultz, R. E.; Scanlon, P. F.; Helfrich, L. A. AVIAN PREDATION AT UNITED STATES FISH HATCHERIES. Va. J. Sci. 29 (2): 69. 1978. Abstract only. SFA 24(4)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061] A survey of federal fish hatcheries in the continental United States and Alaska was conducted to determine the extent and severity of avian predation on fish hatcheries as well as to determine what avian species were the most serious predators. A list of 58 birds species in 14 families was provided. Managers of hatcheries were asked to indicate which species or members of what family caused problems by predation in their hatcheries. They were asked to rank the severity of the problem i.e. severe, significant, trivial, or none. They were also asked which fish species were preyed upon and also to identify any bird predators not on the list provided. The survey elicited a 70 percent response from 121 managers. Of the 58 species on the survey form 28 species in 9 families were mentioned by managers as predators visiting fish hatcheries. Additionally, 7 species from 5 other families were added by managers as being pests at hatcheries. Seventeen species in 9 families were mentioned as causing "severe" damage to fish stocks.

79-002499 Vorobieva, N. K.; Chechun, T. Y.; Romanenko, V. F. RESULTS OF EXPERIMENTAL WORK CARRIED OUT ON PRODUCING BROOD STOCKS OF THE STEELHEAD TROUT AND THE STRIPED BASS IN THE AZOV-BLACK SEA BASIN. Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 189-192. 1976[1977]. SFA 24(4)
[AzCHerNIRO, Kerch, USSR]

TROUT AND SALMON CULTURE

79-002500 Aro, K. V. TRANSFERS OF EGGS AND YOUNG OF PACIFIC SALMON WITHIN BRITISH COLUMBIA. Fish. Environ. Can. Fish. Mar. Serv. Tech. Rep. No. 861. iv + 147p. Mar. 1979. In English with French summ. SFA 24(4)
[Fish. Mar. Serv., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

79-002501 Heard, W. R.; Martin, R. M. FLOATING HORIZONTAL AND VERTICAL RACEWAYS USED IN FRESHWATER AND ESTUARINE CULTURE OF JUVENILE SALMON, /ONCORHYNCHUS/ SPP. Mar. Fish. Rev. 41 (3): 18-23. Mar. 1979. SFA 24(4)
[NMFS, P.O. Box 155, Auke Bay, AK 99821]

79-002502 Jungwirth, M. OVULATION INDUCEMENT IN PRESPAWNING ADULT DANUBE SALMON (/HUCHO HUCHO/, L.) BY INJECTION OF ACETONE-DRIED CARP PITUITARY (CP). Aquaculture 17 (2): 129-135. June 1979. SFA 24(4)
[Limnol. Inst. Ostenreich. Akad. Wissenshaft., Vienna, Austria] In order to obtain simultaneous ovulation of all Danube salmon females within a hatching stock, i.e. of those fish kept in hatchery ponds for several years as well as of those recently collected in rivers, injection of carp pituitary (cP) was attempted. Total doses of 4 mg cP/kg body weight administered in a single application induced ovulation after 98 to 210 h. Application of two subsequent doses (a pre-injection of 10 percent followed by a post-injection of 90 percent after 12 h) resulted in a better synchronized ovulation 142 to 162 h after the first injection. Further consequences of injecting two separate cP doses were easier egg stripping, higher fertilization rates of the eggs and lower mortality during embryonic development. The possibility of a general application of cP for artificial breeding of Danube salmon is discussed.

79-002503 Romanycheva, O. D. [CAGE GROWING OF THE RAINBOW TROUT AND COHO SALMON.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 367-378. 1976[1977]. In Russian with English summ. SFA 24(4)
[VNIRO, 17 Krasnoselskaya, Moscow B-140, USSR]

79-002504 Sano, S. [SOME PROBLEMS ON THE ARTIFICIAL PROPAGATION OF PACIFIC SALMON.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 1: 73-81. 1972[1977]. In Japanese with English summ. SFA 24(4)
[Assoc. Technol. Dev. Fish. Resour., Hokkaido, Sapporo, Japan]

79-002505 Savvaitova, K. A.; Maksimov, V. A.; Mina, M. V.; Novikov, G. G. THE KAMCHATKA REPRESENTATIVES OF /SALMO/ GENUS VIEWED AS SUBJECTS FOR FISH CULTURE AND ACCLIMATION. Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 127-137. 1974[1977]. SFA 24(4)
[Chair Ichthyol., Moscow Univ., Moscow, USSR]

OTHER ANADROMOUS SPECIES CULTURE

79-002506 Inslee, T. D. HOLDING STRIPED BASS LARVAE IN CAGES UNTIL SWIM-UP. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 422-424. 1977[1979]. SFA 24(4)
[U.S. FWS, Fish Cult. Dev. Cent., Tishomingo, OK 73460] The need to suspend newly hatched striped bass (/Morone saxatilis/) larvae until swim-up prompted comparison of holding techniques. Fingerling returns were tabulated over a 3 yr period from fry held in aquaria vs. returns from fry held in Saran cages in rearing ponds. Mean production for a 3 yr period from ponds stocked with fry held in cages was better overall than other methods. The success of holding cages resulted in a substantial saving in manpower as constant care of fry was not needed. The cage holding method is only 1 of many facets of striped bass rearing and is only a contributing factor to high production, not a critical factor such as the quantity and quality of food available. This technique would apply to those situations where unsuitable temperature, turbidity or limited facilities make the tank or aquaria method impractical.

79-002507 Suzuki, K.; Hishi, G. [REARING OF STURGEONS IN JAPAN.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 379-393. 1976[1977]. In Japanese with English summ. SFA 24(4)
[Mar. Sci. Mus., Tokai Univ., Shimizu, Shizuoka-ken, Japan]

WARMWATER CULTURE

79-002508 Appelbaum, S.; Uland, B. INTENSIVE REARING OF GRASS CARP LARVAE /CTENOPHARYNGODON IDELLA/ (VALENCIENNES 1844) UNDER CONTROLLED CONDITIONS. Aquaculture 17 (2): 175-179. June 1979. SFA 24(4)
[Zool. Mus., Univ. Hamburg, Martin-Luther-King-Platz 3, 2000 Hamburg 13, West Germany] This paper describes an indoor feeding experiment with grass carp larvae. It was intended to identify rates of survival and growth of newly hatched larvae in a hatchery using dry feed only until they reached a size which allowed stocking in growing ponds without additional nursing. The larvae fed on Alkan yeast reached a mean total length of 10.3 mm with negligible mortality rates within a feeding period of 1 week. Problems concerning optimal feeding with dry feed and optimal stocking densities in rearing tanks are briefly discussed.

79-002509 Avnimelech, Y.; Lacher, M. A TENTATIVE NUTRIENT BALANCE FOR INTENSIVE FISH PONDS. Bamidgeh 31: (1): 3-8. Mar. 1979. SFA 24(4)
[Fac. Agric. Eng., Tech. Isr. Inst. Technol., Res. Dev. Found. Ltd., Haifa, Israel] Balances of organic carbon, nitrogen and phosphorus in an intensive fish pond were calculated for the period of 1973-1977. The fish's recovery of the organic carbon, nitrogen and phosphorus added with the food, amounted to 65, 11 and 32 percent, respectively. Most of the non-recovered nutrients sedimented to the bottom of the fish pond and accumulated there. The accumulation of nutrients in the sediment was measured by analysis of sediment cores. Results similar to those from nutrient balances were obtained.

79-002510 Chappell, J. A. AN EVALUATION OF TWELVE GENETIC GROUPS OF CATFISH FOR SUITABILTIY IN COMMERCIAL PRODUCTION. Ph.D. dissertation, Auburn Univ. 86p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(1):71. July 1979. SFA 24(4)

Twelve genetic groups of catfish were evaluated for suitability in commercial production ponds. Yields of catfish stocked in separate ponds ranged from 4265 to 2405 kg/ha. There were significant differences between weight gains for blue, channel and white catfish. Blue-channel hybrids exhibited a 10 percent heterotic effect for weight gain over parent species. Channel catfish inbred and crossbred groups produced no statistically significant differences for weight gain. Significant differences existed between tested groups for fat, moisture and protein levels in dressed carcass and processing waste. Survival ranged from 100 to 84.1 percent among separately stocked genetic groups. all groups survived at rates greater than 93 percent with the exception of white catfish (84.1 percent).

79-002511 Lellak, J. POPULATION DYNAMICS OF THE BOTTOM FAUNA AND ITS RESPECT TO THE FISH STOCK IN THE CARP PONDS. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2194. 1978. SFA 24(4)

[Hydrobiol. Dep., Charles Univ., Vinicna 7, CS-128 44 Praha 2, Czechoslovakia]

79-002512 Matsuno, T.; Nagata, S.; Iwahashi, M.; Koike, T.; Okada, M. [INTENSIFICATION OF COLOR OF FANCY RED CARP WITH ZEAXANTHIN AND MYXOXANTHOPHYLL, MAJOR CAROTENOID CONSTITUENTS OF /SPIRULINA/.] Bull. Jpn. Soc. Sci. Fish. 45 (5): 627-632. May 1979. In Japanese with English summ. SFA 24(4)

[Kyoto Coll. Pharm., Misasagi, Yamashina-ku, Kyoto 607, Japan]

79-002513 Opuszynski, K. SILVER CARP, /HYPOPHTHALMICHTHYS MOLITRIX/ (VAL.), IN CARP PONDS. I. FISHERY PRODUCTION AND FOOD RELATIONS. Ekol. Pol. 27 (1): 71-92. 1979. SFA 24(4)

[Dep. Pond Manage., Inland Fish. Inst., Zabieniec (near Warsaw), 05-500 Praseczno, Poland] The silver carp exerted an influence on increasing pond production under extensive and intensive systems of common carp management. At a super-intensive system of production (above 3000 kg/ha) the silver carp did not cause a significant growth of production nor a saving of fodder. Detritus constituted the basic food of the silver carp. As the density of silver carp increased, individual weight increments declined, quantitative and qualitative changes took place in the food composition, as also in the feeding behaviour of fish. The influence of the silver carp on the common carp production cannot be explained by simple food relations between the two species.

79-002514 Opuszynski, K. SILVER CARP, /HYPOPHTHALMICHTHYS MOLITRIX/ (VAL.), IN CARP PONDS. III. INFLUENCE ON ECOSYSTEM. Ekol. Pol. 27 (1): 117-133. 1979. SFA 24(4)

[Dep. Pond Manage., Inland Fish. Inst., Zabieniec (near Warsaw), 05-500 Piaseczno, Poland] Dense stocking with silver carp of 4 to 12 thousand individuals per hectare caused a number of environmental and biocenotic changes, among others an increase in phytoplankton biomass and in primary production. A theory of ichthyoeutrophication was formulated according to which fishery counteraction to the process of eutrophication would not consist of intensifying fishery management, but of applying measures aimed at maintaining the primary structure of the ichthyofauna community.

79-002515 Opuszynski, K. SILVER CARP, /HYPOPHTHALMICHTHYS MOLITRIX/ (VAL.), IN CARP PONDS. II. REARING OF FRY. Ekol. Pol. 27 (1): 93-116. 1979. SFA 24(4)
[Dep. Pond Manage., Inland Fish Inst., Zabieniec (near Warsaw), 05-500 Piaseczno, Poland] Mortality causes of larvae were determined (insufficiency of proper food, low water temperatures and predacity) and guiding principles formulated for working out biotechnics aimed at assuring a high level of effectiveness and stability in the production of stocking material.

79-002516 Pennington, C. H.; Strawn, K. STOCKING DENSITY: ITS EFFECT ON CAGED-CHANNEL CATFISH PRODUCTION. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 514-518. 1977[1979]. SFA 24(4)
[USAE Waterways Exp. Stn., Vicksburg, MS 39180] Channel catfish (/Ictalurus punctatus/), were reared in 1.0 m^3 cages suspended in the intake canal of a cooling reservoir. Effects of density were tested by stocking cages in replicates of 4 at densities ranging from 500 to 900 fish in increments of 25 individuals. There was a significant increase in net production and variation in length and a significant decrease in feed efficiency, mean fish weight, and percentage of harvestable-size fish as stocking density increased. Survival was not affected by number of fish per cage.

79-002517 Perry, K. R.; Wilson, J. L. EFFECTS OF THE STEROID, METHANDROSTENOLONE, ON GROWTH AND GROSS PATHOLOGY OF CHANNEL CATFISH. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 597-602. 1977[1979]. SFA 24(4)
[Dep. For. Wildl. Fish., Univ. Tenn., Knoxville 37901] Methandrostenolone was not effective in promoting growth in channel catfish (/Ictalurus punctatus/) at the 2.5 mg/kg of body weight/day dosage level. There were no significant differences (.05 level) in treated and untreated fish with respect to total weight gain, percent crude protein, and moisture content of the flesh. No differences were observed in gross morphology, liver to body weight ratios, or microscopic examination of liver sections. However, after approximately 3 to 4 wks in a distilled water bath, the hemotoxylin/eosin stain had cleared only from liver sections of the catfish receiving the steroid.

79-002518 Prentice, J. A.; Dean, W. J., Jr. EFFECT OF TEMPERATURE ON WALLEYE EGG HATCH RATE. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 458-462. 1977[1979]. SFA 24(4)
[Tex. Parks Wildl. Dep., Ingram 78025] This study was conducted to determine if water temperature increases during the walleye (/Stizostedion vitreum vitreum/) spawning period reduced egg hatch rate and if water temperature manipulation during egg fertilization would increase hatch rate. Walleye eggs were subjected, before and during fertilization, to 1 of 3 treatments involving water temperatures above and below 12 C. Water temperatures above 12 C were found to reduce hatch rates. Stripping and fertilizing eggs collected from reservoir water temperatures above 12 C into water chilled to 7.2 C significantly increased hatch rates. Use of this technique could improve walleye culture and management operations in some southern regions.

79-002519 Ranoemihardjo, B. S.; Hamami, E. IMPROVED METHODS OF MILKFISH CULTURE. II. INCREASING PRODUCTION IN SHALLOW UNDRAINABLE BRACKISHWATER PONDS. Bull. Shrimp Cult. Res. Cent. (Jepara) 2 (1-2): 107-113. Jan.-July 1976. SFA 24(4)

[Shrimp Cult. Res. Cent., Jepara, Indonesia] Field test on milkfish culture was conducted in shallow undrainable ponds with the application of 825 kg/ha of cowdung, 300 kg/ha of fine rice bran, 130.4 kg/ha of urea, and 134.4 kg/ha of triple superphosphate. A total of 160 kg/ha of rice bran was also introduced as supplementary feed. Bestan 60 at a rate of 0.5 ppm was applied to the pond during preparation to eradicate Cerithidea; BHC 6 percent and Diazinon 60 EC at a rate of 0.08 ppm active ingredient was applied to eradicate chironomid larvae. Total number of 3044 post fingerlings per hectare with weight ranging from 23.6 - 160 g were stocked in the rearing pond. The rearing period was 93 days and a net production of 401.4 to 455.8 kg/ha was realized.

79-002520 Romaire, R. P. MODELING THE DYNAMICS OF DISSOLVED OXYGEN IN CHANNEL CATFISH PRODUCTION PONDS. Ph.D. dissertation, Auburn Univ. 105p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(1):79. July 1979. SFA 24(4)

A mathematical model for simulating nighttime decline in dissolved oxygen (DO) concentrations was developed for channel catfish ponds. This model incorporated data on plankton respiration from the present study, data from the literature on respiration by channel catfish, respiration by benthic organisms, and O(2) diffusion. The model was validated for six catfish ponds. A simple, graphical technique for estimating DO concentrations at dawn from DO measurements made at dusk and 2 to 3 h later also gave good estimates of nighttime DO decline. Although this technique has several limitations, it will be useful when it is not possible to measure COD and when Secchi disk measurements cannot be used to estimate O(2) consumption by plankton. A numerical model was developed for simulating the effects of cloudy weather (low solar radiation) on DO depletion in channel catfish ponds. Simulation results demonstrated that the combination of dense plankton blooms and low levels of light intensity were closely related with low concentrations of DO. A practical procedure for assessing the probability of incurring weather-related DO problems was developed.--From abstr.

79-002521 Rottmann, R. W.; Shireman, J. V. TANK SPAWNING OF GRASS CARP. Aquaculture 17 (3): 257-267. July 1979. SFA 24(4)

[Sch. For. Resour. Conserv., Univ. Fla., Gainesville 32611] Induced spawning of grass carp in indoor tanks without hand stripping of gametes is described. Circular tanks (1.83 m diameter) with biofiltration units were utilized for conditioning and spawning. This method was found to be successful and has several advantages over the dry-fertilization method: (1) preliminary ripening and spawning is conducted in small systems where the environment is controlled; (2) manpower requirements are reduced; (3) handling of brood fish is reduced, thereby minimizing mortalities; and (4) spawning occurs when the fish is physiologically ready, insuring good egg quality.

79-002522 Steinbach, D. W. AN INTENSIVE CULTURE SYSTEM FOR CHANNEL CATFISH FINGERLINGS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 484-492. 1977[1979]. SFA 24(4)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] Channel catfish (/Ictalurus punctatus/) were stocked at rates of 250, 500, 1,000 and 2,000 fry/208 l drum, and reared to fingerling size. No significant differences occurred in rate of gain from days 0-33, but gains ranged from 0.22 g/day at the 250 stocking rate to 0.08 g/day at the 2,000 stocking rate from days 0-70. The highest average total biomass of 10,095 g was reached at the 2,000 stocking rate. Flow rate was maintained at a constant 0.32 l/sec in all drums. Food conversion from days 17-70 ranged from 1.42 at the 250 stocking rate to 2.67 at the 2,000 stocking rate. Water quality was monitored to evaluate the effect on growth. Oxygen concentration became a critical limiting factor as total biomass increased. Growth rates were best at the lower stocking rates in which the oxygen concentrations were higher.

79-002523 Stickney, R. R.; Hesby, J. H.; McGeachin, R. B.; Isbell, W. A. GROWTH OF /TILAPIA NILOTICA/ IN PONDS WITH DIFFERING HISTORIES OF ORGANIC FERTILIZATION. Aquaculture 17 (3): 189-194. July 1979. SFA 24(4)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] A series of six 0.04 ha ponds that had received varying rates of organic fertilization during 1976 and 1977 were each stocked with 200 /Tilapia nilotica/ for a 3.5 month period during the 1978 growing season. Slotted feeding floors were placed over five of the six ponds and two growing-finishing hogs were placed on each feeding floor. The sixth pond recieved neither manure nor supplemental feed. Growth of /T. nilotica/ was most rapid in ponds that had a history of relatively high manuring rates. Condition factors paralleled fish growth. Survival was 75 percent or more in each of the ponds with no apparent correlation between percent survival and history of manuring. Water quality was similar and acceptable for tilapia in each of the six ponds. The data indicated that a stocking rate of 50 hogs/ha can result in high fish yields; and that the history of a pond's experimental use influences subsequent experimental results.

79-002524 Szumiec, J. RANGE OF CHANGES IN FISHPOND ENVIRONMENT INFLUENCED BY INTENSIVE CARP FARMING. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2137-2141. 1978. SFA 24(4)
[Fish Cult. Stn., Golysz, Zaborze, PL-43-422 Chybie, Poland]

79-002525 Turner, C. J.; Lawrence, J. M.; Bayne, D. R. THE EFFECTS OF HEATED WATER ON WARMWATER FISH IN EARTHEN RACEWAYS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 332-342. 1977[1979]. SFA 24(4)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36830] Two-year studies were conducted in 3 earthen raceways (160 m x 6 m x 2 m). One raceway was maintained at ambient water temperature, 1 had heated floating plume over 60 percent of the surface, and 1 was maintained at near heated water discharge temperature. Average water temperatures ranging up to 36.7 C were not lethal for any fish species tested. With the possible exception of threadfin shad (/Dorosoma petenense/) no difference in long-term survival of any species was detected, but when the entire population was considered as a whole, survival of fishes confined to the highest temperatures was reduced. Growth rates of largemouth (/Micropterus salmoides/) and spotted basses (/M. punctatus/), channel catfish (/Ictalurus punctatus/), redear sunfish (/Lepomis microlophus/), and gizzard shad (/D. cepedianum/) in at least 1 of the heated water

79-002525 CONTINUED
treatments exceeded growth in the control. Total standing crop and growth rates of bluegill (/L. macrochirus/) and drum (/Aplodinotus grunniens/) were lowest in the treatment with highest water temperatures. Little difference was seen between the control and the treatment with a floating heated water plume.

MARICULTURE

79-002526 Arnold, C. R.; Bailey, W. H.; Williams, T. D.; Johnson, A; Lasswell, J. L. LABORATORY SPAWNING AND LARVAL REARING OF RED DRUM AND SOUTHERN FLOUNDER. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 437-440. 1977[1979]. SFA 24(4)
[NMFS, Port Aransas, TX 78373] Laboratory spawning and larval rearing studies were conducted with red drum (/Sciaenops ocellata/) and southern flounder (/Paralichthys lethostigma/) from 1974 through 1977. Adult fish were placed in 29.92 kl spawning tanks equipped with biological filters and subjected to photoperiods and temperatures regulated to simulate seasonal variations. Red drum spawned 52 times producing 6.0 x 10^7 eggs. Southern flounder spawned 13 times producing 1.2 x 10^5 eggs. Eggs were collected and incubated, and larvae were reared to fingerling size. This paper describes techniques used to produce fingerling red drum and southern flounder.

79-002527 Aronovich, T. [ARTIFICIAL BREEDING OF MULLET /MUGIL CEPHALUS/ L.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 4: 29-41. 1975[1977]. In Russian. SFA 24(4)
[VNIRO, 17 Krasnoselskaya, Moscow B-140, USSR]

79-002528 Aronovich, T. M. SOVIET EXPERIMENTS ON ARTIFICIAL REARING OF COD SPECIES (GADIDAE). Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 101-112. 1974[1977]. SFA 24(4)
[VNIRO, 17 Krasnoselskaya, Moscow B-140, USSR]

79-002529 Ayushin, B. N.; Chigirinsky, A. I. [BIOECOLOGICAL BASIS AND TRENDS OF MARICULTURE DEVELOPMENT IN THE FAR-EAST COAST.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 317-325. 1976[1977]. In Russian with English summ. SFA 24(4)
[TINRO, 20, Lenin St., Vladivostok, USSR]

79-002530 Ayushin, B. N. [EXPERIMENTS ON THE SPAWNING OF PACIFIC SAURY ON AN ARTIFICIAL SPAWNING BED IN JAPAN SEA.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 1: 67-72. 1972[1977]. In Russian and Japanese. SFA 24(4)
[TINRO, Vladivostok, USSR]

79-002531 Benko, Y. K. [THE PRESENT STATUS OF INVESTIGATION ON MARICULTURE IN THE USSR.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 37-46. 1976[1977]. In Russian with Japanese summ. SFA 24(4)
[AzCHerNIRO, Kerch, USSR]

79-002532 Benko, Y. K. [PRESENT STATUS AND PROSPECTS OF THE DEVELOPMENT OF MARICULTURE IN THE BLACK SEA.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 305-316. 1976[1977]. In Russian with English summ. SFA 24(4)
[AzCHerNIRO, Kerch, USSR]

79-002533 Chervinski, J. PRELIMINARY EXPERIMENTS ON THE ADAPTABILITY OF JUVENILE EUROPEAN SEA BASS (/DICENTRARCHUS LABRAX/ (L)) AND GILTHEAD SEA BREAM (/SPARUS AURATA/ (L)) TO BRACKISH WATER. Bamidgeh 31 (1): 14-17. Mar. 1979. SFA 24(4)
[Fish Aquacult. Res. Stn., Dor, Israel] Laboratory experiments were conducted to determine the adaptability of juveniles of European sea bass (/Dicentrarchus labrax/ (L)) (26.06 mg) and gilthead sea bream (/Sparus aurata/ (L)) (0.38 g) to transfer from sea water (S = 35 °/oo) to brackish water (S = 1.2 °/oo). It was found that both species were able to tolerate a salt concentration of 1.2 °/oo through gradual adaptation. After a 7 day stay in the brackish water, the fish were readapted to sea water during a 3 hour period. The results indicate that they were well able to tolerate the abrupt change. The possibility of using brackish water for raising fry is discussed.

79-002534 Doroshev, D. I. THE PRESENT STATUS AND PERSPECTIVES FOR ARTIFICIAL REARING AND ACCLIMATION OF SEA AND BRACKISH-WATER FISH IN THE USSR. Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 63-73. 1974[1977]. SFA 24(4)
[VNIRO, 17 Krasnoselskaye, Moscow B-140, USSR]

79-002535 Dushkina, L. A.; Khuzin, R. Sh.; Rozhdestvenskaya, A. D.; Gorislavskaya, M. M. [THE EXPERIMENTS TO INCREASE THE EFFECTIVENESS OF NATURAL REPRODUCTION OF MARINE SPECIES AND TO STUDY THE ACCLIMATIZATION AND REARING OF DIADROMOUS SALMON IN THE BARENTS AND WHITE SEAS.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 209-221. 1976[1977]. In Russian with English summ. SFA 24(4)
[PINRO, Murmansk, USSR]

79-002536 Fujita, S. [THE PRESENT STATUS AND PROBLEMS OF MARINE FISH BREEDING TECHNIQUES IN JAPAN.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 327-338. 1976[1977]. In Japanese with English summ. SFA 24(4)
[Mar. Aquacult. Lab., Nagasaki Pref. Inst. Fish., Nomozaki-cho, Nishisonagi-gun, Nagasaki-ken, Japan]

79-002537 Higuchi, M. [MARICULTURE IN WARM SEAS: PRESENT STATUS OF MARICULTURE IN THE SETO INLAND SEA.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 157-171. 1974[1977]. In Japanese with English summ. SFA 24(4)
[Kuwait Inst. Sci. Res., P.O. Box 12009, Kuwait]

79-002538 Inoue, M. [RECENT STUDIES ON PROPAGATION AND CULTURE OF SKIPJACKS AND TUNAS.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 6: 21-34. 1977[1978]. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka, Japan 424]

79-002539 Inoue, M. [ECOLOGICAL STUDY ON TUNAS IN THE PACIFIC OCEAN AND THEIR ARTIFICIAL PROPAGATION.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 2: 29-38. 1973[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka-ken, Japan]

79-002540 Inoue, M. [RECENT TRENDS IN ARTIFICIAL PROPAGATION OF TUNAS.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 1: 57-66. 1972[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan]

79-002541 Inoue, M.; Yatomi, H.; Miyashita, A.; Shouji, A.; Ishiwata, K.; Tanaka, O. [STUDIES ON DOMESTICATION AND EXTENSIVE BREEDING OF SKIPJACK, TUNAS AND OTHER FISHES--I. BEHAVIOR OF THE SCOMBRIDAE AND THE CARANGIDAE BRED TOGETHER IN FISH PRESERVE (ARTIFICIAL FLOATING FISH REEF) AND EXPERIMENTAL EXTENSIVE BREEDING.] J. Fac. Mar. Sci. Technol. Tokai Univ. No. 12. p. 209-221. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ, Japan]

79-002542 Iwashita, M. FUTURE OF THE PACIFIC OCEAN: FLOATING HATCHERY CONCEPT. Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 7-12. 1976[1977]. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka-ken, Japan]

79-002543 Iwashita, M. PRESENT STATUS AND FUTURE PROSPECTS OF THE FISHERIES INDUSTRY OF JAPAN. Proc. Sov.-Jpn. Joint Symp. Aquacult. 4: 5-9. 1975[1977]. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka-ken, Japan]

79-002544 Kangur, M. [MAIN TRENDS IN THE DEVELOPMENT OF AQUACULTURE IN THE COASTAL WATERS OF THE BALTIC SEA.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 4: 79-83. 1975[1977]. In Russian. SFA 24(4)
[Tallinn Br., Baltic Inst. Oceanogr., Tallinn, Estonia, USSR]

79-002545 Kirakake, T.; Takagi, N. [COASTAL CIVIL ENGINEERING WORK FOR CONSTRUCTION OF FISHING GROUNDS.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 7-19. 1974[1977]. In Japanese with English summ. SFA 24(4)
[Natl. Fed. Fish. Coop. Assoc., Nagaya, Japan]

79-002546 Kosaka, M. [ECOLOGY OF FLATFISHES IN THE COASTAL WATERS OF JAPAN AND THEIR PROPAGATION.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 4: 19-28. 1975[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka-ken, Japan]

79-002547 Martosudarmo, B.; Ranoemihardjo, B. S.; Sabaruddin, S. NET ENCLOSURES AND FISH PENS FOR REARING OF MILKFISH FOR SPAWNERS. Bull. Shrimp Cult. Res. Cent. (Jepara) 2 (1-2): 99-106. Jan.-July 1976. SFA 24(4)
[Shrimp Cult. Res. Cent., Jepara, Indonesia] In the procurement of milkfish spawners for induced breeding work fish pens and net enclosures were used for milkfish rearing to mature size. Details on materials used, method of construction and the problems encountered in establishment of fish pens and net enclosures were discussed.

79-002548 Moiseev, P. A. LIVING RESOURCES OF THE WORLD OCEAN: PROSPECTS OF UTILIZATION AND AUGMENTATION. Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 13-18. 1976[1977]. SFA 24(4)
[VNIRO, Moscow, USSR]

79-002549 Proskurenko, I. V. [THE PLANNING OF TECHNICAL FACILITIES IN MARICULTURE.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 297-304. 1976[1977]. In Russian with English summ. SFA 24(4)
[TINRO, 20, Lenin St., Vladivostok, USSR]

79-002550 Romanycheva, O. [COMMERCIAL REARING OF STURGEONS AND SALMON FISHES IN MARINE CAGES.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 4: 71-77. 1975[1977]. In Russian. SFA 24(4)
[VNIRO, 17 Krasnoselskaya, Moscow B-140, USSR]

79-002551 Romanycheva, O. D. [THE MODERN CONDITION OF THE DEVELOPMENT OF THE MARINE STURGEON CULTURING FOR COMMERCIAL PURPOSES AND ITS PERSPECTIVES.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 353-365. 1976[1977]. In Russian with English summ. SFA 24(4)
[VNIRO, 17 Krasnoselskaya, Moscow B-140, USSR]

79-002552 Sato, S. [SYSTEM ENGINEERING OF GOVERNMENT-SPONSORED "OCEAN RANCH" IN THE INTERNATIONAL OCEAN EXPOSITION, OKINAWA, 1975.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 195-203. 1974[1977]. In Japanese with English summ. SFA 24(4)
[Tohoku Reg. Fish. Res. Lab., Jpn. Fish. Agency, Shiogama, Miyagi-ken, Japan]

79-002553 Takanashi, A. [SOME PLANS OF SYSTEM STUDY ON MARICULTURE BY APPLICATION OF ELECTRONIC ENGINEERING.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 113-125. 1974[1977]. In Japanese with English summ. SFA 24(4)
[Global Video Corp., 4-20-1, Sendagaya, Shibuya-ku, Tokyo, Japan]

79-002554 Tamura, T. SOME PROBLEMS IN MARICULTURE ON THE NORTHERN COASTS OF JAPAN. Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 19-36. 1976[1977]. SFA 24(4)
[30-13, Tokito-cho, Hakodate, Hokkaido, Japan]

79-002555 Tanaka, J. UTILIZATION OF HEATED DISCHARGE WATER FROM ELECTRIC POWER PLANTS IN AQUACULTURE. Proc. Sov.-Jpn. Joint Symp. Aquacult. 4: 53-69. 1975[1977]. In English and Japanese. SFA 24(4)
[Maricult. Sect., Tokai Reg. Fish. Res. Lab., Arazaki, Nagai, Yokosudka, Japan]

79-002556 Yatomi, H.; Inoue, M.; Miyashita, A.; Machida, H.; Shimada, H. [STUDIES ON DOMESTICATION AND EXTENSIVE BREEDING OF SKIPJACK, TUNAS AND OTHER FISHES--II. ON THE GATHERING AND SCATTERING BEHAVICUR OF FISHES CBSERVED IN SUMMER AT THE ARTIFICIAL FLOATING FISH REEF AT MERA BAY.] J. Fac. Mar. Sci. Technol. Tokai Univ. No. 12. p. 223-234. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ, Japan]

FEEDS, FEEDING AND NUTRITION

79-002557 Barnett, B. J.; Cho, C. Y.; Slinger, S. J. THE ESSENTIALITY OF CHOLECALCIFEROL IN THE DIETS OF RAINBOW TROUT (/SALMO GAIRDNERI/). Comp. Biochem. Physiol. A Comp. Physiol. 63 (2): 291-297. 1979. SFA 24(4)
[Fish Nutr. Lab., Dep. Nutr., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Vitamin D(3) was found to be essential in the diet of rainbow trout. Vitamin D(3) deficiency in rainbow trout was characterized by a marked decrease in weight gain and feed efficiency, lethargy and anorexia, the clinical manifestations of tetany without hypocalcaemia, an increase in the lipid content of carcass, white muscle and liver, and increase carcass dry matter. Unlike mammals, bone and blood mineral stores appeared unaltered in vitamin D(3) deficient rainbow trout. With trout maintained in water containing 30 ppm of calcium, increasing the level of dietary calcium from 0.36 percent to 1.1 percent increased the amount of white muscle lipid and descreased the kidney magnesium levels, but exerted no effect on weight gain or feed efficiency, regardless of vitamin D(3) status. Rainbow trout receiving feed containing 1000 i.u./kg of vitamin D(3) showed no detectable amounts of 25-hydroxycholecalciferol or 24R, 25-dihydroxycholecalciferol in their blood plasma.

79-002558 Jee, A. K.; Mohsin, A. K. M. SUITABILITY OF AGRICULTURAL BYPRODUCTS AS FEED OF CCMMON CARP FRY, /CYPRINUS CARPIO/ L. IN NET CAGES. Malays. Appl. Biol. 7 (1): 19-25. June 1978. SFA 24(4)
[Div. Fish. Mar. Sci., Univ. Agric. Malaysia, Serdang, Selangor, Malaysia] Three groups of three replicates each of Common Carp fry were stocked in net cages measuring 2.0 x 1.5 x 1.0 m^3 in a pond to test the suitability of three formulated diets. The stocking rate was 100 fish/cage. The protein content of diets 1, 2 and 3 were 24.2, 30.0 and 26.7 percent respectively. The growth rate of common carp fed with these diets were poor. Reasons for poor growth were discussed. There was no significant difference in the growth of the fish fed with the three diets (P greater than 0.05). The survival rate of fish fed with diets 1, 2 and 3 were 89.3, 87.7 and 83.3 percent respectively.

79-002559 Kitajima, C.; Fujita, S.; Ohwa, F.; Yone, Y.; Watanabe, T. [IMPROVEMENT OF DIETARY VALUE FOR RED SEA BREAM LARVAE OF ROTIFERS /BRACHIONUS PLICATILIS/ CULTURED WITH BAKER'S YEAST /SACCHAROMYCES CEREVISIAE/.] Bull. Jpn. Soc. Sci. Fish. 45 (4): 469-471. Apr. 1979. In Japanese with English summ. SFA 24(4)

[Aquacult. Res. Lab., Nagasaki Pref. Inst. Fish., Nomozaki, Nagasaki 851-05, Japan] The rotifers /Brachionus plicatilis/ cultured with baker's yeast /Saccharomyces cerevisiae/ (Y-rotifers), a living feed for fish larvae, are much lower in dietary value than those cultured with marine chlorella (C-rotifers). A trial was conducted in order to improve the low dietary value of Y-rotifers by feeding them marine chlorella /Chlorella minutissima/ for 10 min to 24 hrs at regular intervals before they were given to red sea bream larvae. The dietary value of the secondary cultured rotifers in each period was compared with that of C-rotifers. The dietary value of Y-rotifers was found to be improved effectively by the secondary culture with chlorella. The larvae fed on Y-rotifers cultured secondarily for more than 6 hrs showed good growth conditions and a high survival rate, comparable to those obtained by the larvae fed on C-rotifers. On the other hand, the dietary value of Y-rotifers was not much improved by the secondary culture with freshwater chlorella /Chlorella reguralis/.

79-002560 Lim, C.; Sukhawongs, S.; Pascual, F. P. A PRELIMINARY STUDY ON THE PROTEIN REQUIREMENTS OF /CHANOS CHANOS/ (FORSKAL) FRY IN A CONTROLLED ENVIRONMENT. Aquaculture 17 (3): 195-201. July 1979. SFA 24(4)

[Aquacult. Dep., Southeast Asian Fish. Dev. Cent., P.O. Box 256, Iloilo City, Philippines] Milkfish (/Chanos chanos/) fry with an average weight of 40 mg per fish were stocked in 60-l wooden-glass aquaria filled with 30 l of filtered sea water with a salinity of 32-34 p.p.t. and a temperature of 25-28°C. They were fed diets containing 20, 30, 40, 50 and 60 percent protein and 2740 kcal of digestible energy per kg at a daily rate of 10 percent of the biomass for a period of 30 days. Fish which were fed the diet containing 40 percent protein had the highest weight gain which was significantly higher (P less than 0.05) than those of fish receiving the lower dietary levels of protein. Slightly lower weight gains were obtained when fish were fed diets containing 50 and 60 percent protein. Although feed conversion values were not statistically different (P less than 0.05) among all treatments, the value for the 40 percent protein diet (1.96) was the best. The mean survival rates were low for all treatments but was highest for the 40 percent protein diet. No significant difference (P less than 0.05) was found in the survival rates of fish receiving different treatments. Results show that a dietary level of 40 percent protein was required by milkfish fry for maximum growth, efficient feed conversion and high survival rate.

79-002561 Marais, J. F. K.; Kissil, G. W. THE INFLUENCE OF ENERGY LEVEL ON THE FEED INTAKE, GROWTH, FOOD CONVERSION AND BODY COMPOSITION OF /SPARUS AURATA/. Aquaculture 17 (3): 203-219. July 1979. SFA 24(4)

[Dep. Zool., Univ. Port Elizabeth, P.O. Box 1600, Port Elizabeth, South Africa] /Sparus aurata/ of mean weight 43.7 g were fed five diets differing in energy (soybean oil) for three months. Lowest energy diet contained 19,610 J/g and highest 21,140 J/g. Protein and fat contents for the species exceeded the minimum requirements of 40 percent and 8 percent, respectively. Feed intake and growth were significantly higher for fish on the lower energy (soybean oil) diets. Energy conversion factor was also significantly lower in the lower energy diets. No significant differences in feed or protein and ash conversion factors, protein efficiency ratio, protein productive value

79-002561 CONTINUED
and feed conversion efficiency were found. Increases in body protein and fat and energy were significantly higher in the lower energy treatments; however, body composition was not affected by treatment. Significant correlation coefficients between different body components enabled calculation of regression equations by which biologically important parameters, such as protein, fat, ash and energy, can be estimated from a relatively simple moisture determination.

79-002562 McGeachin, R. B.; Stickney, R. R.; Arnold, C. R. ALGAE-FED BRINE SHRIMP NAUPLII AS A FOOD SOURCE FOR LARVAL SPOTTED SEATROUT. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 574-582. 1977[1979]. SFA 24(4)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] Larval spotted seatrout (/Cynoscion nebulosus/) grew faster on 1 and 2 day prefed brine shrimp (/Artemia salina/) nauplii than fish fed newly-hatched nauplii. Fish growth and survival were reduced when 3 and 4 day prefed, as compared with newly-hatched nauplii were offered. Proximate analysis and calorimetry demonstrated the occurrence of a temporal decline in the nutritional value of both fed and unfed brine shrimp nauplii. At the relatively low levels of algal cell concentration available for prefeeding brine shrimp, this study indicates that 1 day old unfed nauplii are nutritionally equal to algae prefed nauplii as a food source for larval spotted seatrout. One day old brine shrimp nauplii are a better food organism for larval spotted seatrout 12 to 21 days of age than newly-hatched nauplii because of the larger size of the former.

79-002563 Mortensen, W.; Vahl, O. A PROGRAMMED CONTROLLER FOR AUTOMATIC FEEDERS. Aquaculture 17 (1): 73-76. May 1979. SFA 24(4)
[Inst. Biol. Geol., Univ. Tromso, P.O. Box 790, 9001 Tromso, Norway] A system which controls the amount of rations fed and the length of the feeding periods independently in each of six simultaneous experiments is described with circuit diagrams.

79-002564 O'Keefe, T. M.; Purdy, C. B.; Brauer, E. P.; Willoughby, C. E. A MECHANICAL VOLUMETRIC FEEDING DEVICE FOR AQUACULTURE RESEARCH. Aquaculture 17 (1): 69-71. May 1979. SFA 24(4)
[Domsea Farms, Inc., 4398 West Old Belfair Highway, Bremerton, WA 98310] A simple mechanical feeding device is described which can volumetrically deliver a preset quantity of pelleted or granulated dry fish feed.

79-002565 Ostroumova, I. N. [PHYSIOLOGICAL-BIOCHEMICAL STUDIES AIMED AT THE DEVELOPMENT OF FISH FOOD FORMULA.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 65-83. 1976[1977]. In Russian with English summ. SFA 24(4)
[GosNIIORKh, Leningrad, USSR]

79-002566 Reinitz, G. L.; Orme, L. E.; Hitzel, F. N. VARIATIONS OF BODY COMPOSITION AND GROWTH AMONG STRAINS OF RAINBOW TROUT. Trans. Am. Fish. Soc. 108 (2): 204-207. Mar. 1979. SFA 24(4)
[U.S. FWS, Rt. 1, Box 205, Spearfish, SD 57783]

79-002567 Sakaguchi, H.; Hamaguchi, A. [PHYSIOLOGICAL STUDIES ON CULTURED RED SEA BREAM--II. EFFECT OF OXIDIZED OIL ON THE CHEMICAL CONSTITUENTS IN PLASMA, HEPATOPANCREAS AND MUSCLE.] Bull. Jpn. Soc. Sci. Fish. 45 (4): 449-453. Apr. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Fish., Nagasaki Univ., Nagasaki 852, Japan]

79-002568 Sakaguchi, H.; Hamaguchi, A. [PHYSIOLOGICAL STUDIES ON CULTURED RED SEA BREAM--III. DIGESTIBILITY AND CHANGES OF CHEMICAL CONSTITUENTS IN PLASMA AND HEPATOPANCREAS AFTER FEEDING OF OXIDIZED OIL.] Bull. Jpn. Soc. Sci. Fish. 45 (5): 545-548. May 1979. In Japanese with English summ. SFA 24(4)
[Fac. Fish., Nagasaki Univ., Nagasaki 852, Japan]

79-002569 Urquhart, D. L.; Barnard, D. R. GROWTH OF PEN REARED PINK SALMON FRY, /ONCORHYNCHUS GORBUSCHA/, FEEDING ON AVAILABLE MARINE ZOOPLANKTON. Aquaculture 17 (3): 251-256. July 1979. SFA 24(4)
[Inst. Mar. Sci., Univ. Alaska, Fairbanks 99701] Pink salmon fry, /Oncorhynchus gorbuscha/, were held in a small floating net pen for nearly 7 weeks. The pen was moored in a narrow channel where tidal current velocities reach values near 0.4 m/s. The fry were maintained solely by marine zooplankton carried into the enclosure by surface currents. Samples of approximately 100 fry were removed weekly from the pen to monitor growth and diet. For the 1049 fry which began the experiment, fork length (FL) averaged 32.7 mm and wet weight (W) 0.23 g. Forty-eight days later 330 fry remained in the pen; FL had increased to 44.1 mm and W to 0.76 g. Natural mortality in the pen was less than 2 percent during this period.

79-002570 Yone, Y.; Toshima, N. THE UTILIZATION OF PHOSPHORUS IN FISH MEAL BY CARP AND BLACK SEA BREAM. Bull. Jpn. Soc. Sci. Fish. 45 (6): 753-756. June 1979. SFA 24(4)
[Fish. Res. Lab., Kyushu Univ., Tsuyazaki, Fukuoka 811-33, Japan]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

79-002571 Boyd, C. E. ALUMINUM SULFATE (ALUM) FOR PRECIPITATING CLAY TURBIDITY FROM FISH PONDS. Trans. Am. Fish. Soc. 108 (3): 307-313. May 1979. SFA 24(4)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36830]

79-002572 Boyd, C. E. DETERMINATION OF TOTAL AMMONIA NITROGEN AND CHEMICAL OXYGEN DEMAND IN FISH CULTURE SYSTEMS. Trans. Am. Fish. Soc. 108 (3): 314-319. May 1979. SFA 24(4)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36830]

79-002573 Boyd, C. E.; Tucker, C. S. EMERGENCY AERATON OF FISH PONDS. Trans. Am. Fish. Soc. 108 (3): 299-306. May 1979. SFA 24(4)
[Dep. Fish. Allied Aquacult., Auburn Univ. Agric. Exp. Stn., Auburn, AL 36830]

79-002574 Dokukin, M. M. [APPLICATION OF CENTRIFUGAL FISH PUMPS IN FISH BREEDING.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 4:43-46. 1975[1977]. In Russian. SFA 24(4)
[VNIRO, 17 Krasnoselskaya, B-140, Moscow, USSR]

79-002575 Maniwa, Y. [APPLICATION OF UNDERWATER ACOUSTICS TO AQUACULTURE.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 51-62. 1974[1977]. In Japanese with English summ. SFA 24(4)
[Fish. Boat Lab., Jpn. Fish. Agency, Kachidoki, Chuo-ku, Tokyo, Japan]

79-002576 McCraren, J. P.; Millard, J. L.; Woolven, A. M. MASOTEN (DYLOX) AS A CONTROL FOR CLAM SHRIMP IN HATCHERY PRODUCTION PONDS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 329-331. 1977[1979]. SFA 24(4)
[U.S. FWS, Fish. Cult. Dev. Cent., San Marcos, TX 78666]
Information relative to control of problematical clam shrimp (Eubranchiopoda- Conchostraca) with Masoten (Dylox) was accumulated over a 10 yr period at several Southwestern hatcheries. Laboratory and field studies showed that control could be achieved with single applications of Masoten as low as 0.01 mgl (active ingredient). No deleterious effects on fry, fingerlings, or adult fish of several species were noted. Decomposition of the chemical, as well as effects on plankton and bottom fauna, are discussed. The paper places on record the efficacy of Masoten against clam shrimp, a level of treatment for same, and a suggested approach to control.

79-002577 Yamamoto, K. [ENDOCRINOLOGICAL STUDIES RELATED TO ARTIFICIAL PROPAGATION OF FISH.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 1: 13-29. 1972[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Fish., Hokkaido Univ., Hokodate, Japan]

GENERAL LIMNOLOGY AND OCEANOGRAPHY

79-002578 Falter, C. M.; Leonard, J. M.; Skille, J. M.; Stowell, F. M.; Lingg, A. J.; Berry Martin, S. J.; Hersman, L. G. EARLY LIMNOLOGY OF DWORSHAK RESERVOIR. U.S. Army Corps Eng. Walla Walla Dist. Rep. 313p. 1979. SFA 24(4)
[Coll. For. Wildl. Range Sci., Univ. Idaho, Moscow 83843]

79-002579 LaBounty, J. F.; Sartoris, J. J.; Roline, R. A. LIMNOLOGY OF THE UPPER NORTH PLATTE RIVER SYSTEM OF WYOMING: 1977 REPORT OF FINDINGS. U.S. Dep. Interior Bur. Reclam. GR-78-1. iv + 64p. July 1978. SFA 24(4)
[U.S. Bur. Reclam., Eng. Res. Cent., Denver, CO 80225]

79-002580 Rast, W.; Lee, G. F. SUMMARY ANALYSIS OF THE NORTH AMERICAN (US PORTION) OECD EUTROPHICATION PROJECT: NUTRIENT LOADING-LAKE RESPONSE RELATIONSHIPS AND TROPHIC STATE INDICES. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-008. xxi + 455p. Jan. 1978. SFA 24(4)
[Cent. Environ. Stud., Univ. Tex., Richardson 75080]

CHEMICAL LIMNOLOGY AND OCEANOGRAPHY

79-002581 Cornett, R. J.; Rigler, F. H. HYPOLIMNETIC OXYGEN DEFICITS: THEIR PREDICTION AND INTERPRETATION. Science 205 (4406): 580-581. 10 Aug. 1979. SFA 24(4)
[Dep. Biol., McGill Univ., Montreal, PQ H3A 1E1, Canada] Rates of hypolimnetic oxygen depletion can be predicted from a knowledge of a lake's phosphorus retention, the average hypolimnetic temperature, and the mean thickness of the hypolimnion. Areal oxygen deficits cannot be used to index lake trophic status because areal calculations do not eliminate the influence of hypolimnetic morphometry.

79-002582 Jeffries, D. S.; Cox, C. M.; Dillon, P. J. DEPRESSION OF PH IN LAKES AND STREAMS IN CENTRAL ONTARIO DURING SNOWMELT. J. Fish. Res. Board Can. 36 (6): 640-646. June 1979. In English with French summ. SFA 24(4)
[Limnol. Unit, Ontario Minist. Environ., Rexdale, ON M9W 5L1, Canada]

79-002583 Sugiyama, M.; Kawai, A. MICROBIOLOGICAL STUDIES ON THE NITROGEN CYCLE IN AQUATIC ENVIRONMENTS--VI. METABOLIC RATE OF AMMONIUM NITROGEN IN A GOLDFISH CULTURING POND. Bull. Jpn. Soc. Sci. Fish. 45 (6): 785-789. June 1979. SFA 24(4)
[Kyoto Inst. Oceanic Fish. Sci., Miyazu, Kyoto 626, Japan]

BENTHOS

79-002584 Beck, W. M., Jr. ENVIRONMENTAL REQUIREMENTS AND POLLUTION TOLERANCE OF COMMON FRESHWATER CHIRONOMIDAE. U.S. Environ. Prot. Agency Environ. Monit. Ser. EPA-600/4-77-024. vi + 261p. Apr. 1977. SFA 24(4)
[Lab. Aquatic Entomol., Fla. A&M Univ., Tallahassee 32307] Data on the environmental requirements and pollution tolerance of 230 taxa of freshwater chironomids were compiled from 33 references. This compilation was prepared to assist biologists in evaluating data from macroinvertebrate samples collected for the assessment of water quality. The following parameters were considered: developmental stage, pH, salinity, nutrients, degradable dissolved organics, oxygen, temperature, turbidity, current, general habitat, specific habitat, seasonal distribution.

79-002585 Bradt, P. T.; Wieland, G. E. III CORRELATIONS OF MACROINVERTEBRATE POPULATION CHARACTERISTICS WITH PHYSICAL AND CHEMICAL FACTORS IN A TROUT STREAM. Proc. Pa. Acad. Sci. 52 (2): 121-125. 1978. SFA 24(4)

[Dep. Biol., Williams Hall , Lehigh Univ., Bethlehem, PA 18015] A two kilometer stretch of the Bushkill Creek was sampled bi-weekly for chemical and physical parameters and monthly for benthic macroinvertebrate populations for sixteen months. Statistical analysis of the data indicates significant correlations of benthic macroinvertebrate total numbers, total taxa and biomass with flow velocity, discharge, temperature, conductivity, percent oxygen saturation, nitrate and total alkalinity. Partial correlation coefficients indicates significant correlations only between nitrate and total numbers, alkalinity and total numbers, and alkalinity and number of taxa.

79-002586 Dowds, R. E. REFERENCES FOR THE IDENTIFICATION OF MARINE INVERTEBRATES ON THE SOUTHERN ATLANTIC OCAST OF THE UNITED STATES. NOAA Tech. Rep. NMFS SSRF- 729. iv + 37p. Apr. 1979. SFA 24(4)

[24 Briarwood Trail, Weymouth, MA 02188]

79-002587 Grossnickle, N. E.; Morgan, M. D. DENSITY ESTIMATES OF /MYSIS RELICTA/ IN LAKE MICHIGAN. J. Fish. Res. Board Can. 36 (6): 694-698. June 1979. In English with French summ. SFA 24(4)

[Harbor Branch Inst., RR 1, Box 196-A, Fort Pierce, FL 33450]

79-002588 Hornig, C. E.; Pollard, J. E. MACROINVERTEBRATE SAMPLING TECHNIQUES FOR STREAMS IN SEMI-ARID REGIONS. COMPARISON OF THE SURBER METHOD AND A UNIT-EFFORT TRAVELING KICK METHOD. U.S. Environ. Prot. Agency Environ. Monit. Ser. EPA-600/4-78-040. vi + 21p. July 1978. SFA 24(4)

[U.S. EPA, Environ. Monit. Support Lab., Las Vegas, NV 89114] Streams of the arid and semi-arid regions of the western United States are characterized by irregular flow patterns resulting in highly unstable macroinvertebrate habitats and a sparse macrobenthic fauna. The use of a standard square-foot Surber stream-bottom sampler is of limited utility in these regions due to the combined effects of faunal paucity and patchiness. The efficiency of a unit-effort traveling kick method was compared with that of a standard Surber sampler in uniform fauna-poor riffles on the White River, Utah. Comparisons of 50 kick samples with 40 Surber samples revealed that kick samples provided more highly reproducible data than Surber samples revealed in terms of counts of individuals and taxa, percentages of composition, and diversity indices (H). Visual preselection of the richest sites, however, improved the reliability of Surber sampler data. Some differences in organism selectivity of the two sampling methods were noted. The Surber method attributed greater relative importance to the more closely adherent and cryptic forms such as the simuliids, and the kick method was relatively biased towards easily dislodged organisms such as the baetid mayflies.

79-002589 Marsh, P. C. THE EFFECTS OF SILT AND TURBIDITY FROM AGRICULTURAL DRAINAGE ON BENTHIC INVERTEBRATES IN STREAMS OF SOUTHWESTERN MINNESOTA. Ph.D. dissertation, Univ. Minn. 147p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(2):574. Aug. 1979. SFA 24(4)

It was concluded that in regions geologically and topographically similar to southwestern Minnesota, the impact of agricultural drainage on benthic invertebrates in natural downstream receiving waters would probably be minimal.--From abstr.

79-002590 Roy, D. ECHANTILLONNEUR BENTHIQUE D'EAUX COURANTES PEU PROFONDES UTILIXANT UNE POMPE HYDRAULIQUE A MOTEUR. [THE USE OF A HYDRAULIC PUMP FOR SAMPLING THE BENTHOS OF SHALLOW FLOWING WATER.] Ann. Limnol. 14 (3): 289-294. 1978. In French with English summ. SFA 24(4)

[Dep. Biol., Univ. Montreal, C.P. 6128, Montreal 101, PQ, Canada] Classic samplers used in flowing waters to study limnobiontic forms (lenitic aspects) have a reduced efficiency when sampling a mixed substrate. The problem can be solved by the use of a hydraulic pump which directly aspirates the sediments. A self running portable apparatus is described which can sample not only porous movable substrates but also moderately deep rocky bottoms. A double system of filtration immediately separates the sample into two phases of different dimensions.

79-002591 Schuster, G. A.; Etnier, D. A. A MANUAL FOR THE IDENTIFICATION OF THE LARVAE OF THE CADDISFLY GENERA /HYDROPSYCHE/ PICTET AND /SYMPHITOPSYCHE/ ULMER IN EASTERN AND CENTRAL NORTH AMERICA (TRICHOPTERA: HYDROPSYCHIDAE). U.S. Environ. Prot. Agency Environ. Monit. Ser. EPA-600/4-78-060. xii + 129p. Oct. 1978. SFA 24(4)

[State Biol. Surv. Kans., Univ. Kans., Lawrence 66044]

79-002592 Swartz, R. C. TECHNIQUES FOR SAMPLING AND ANALYZING THE MARINE MACROBENTHOS. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-030. vii + 27p. Mar. 1978. SFA 24(4)

[U.S. EPA, Mar. Sci. Cent., Newport, OR 97365] This report presents guidelines for the quantitative assessment of the effects of marine pollution on benthic community structure and population dynamics. The sampling design addresses the number and location of stations, survey frequency, sampling gear, replication of samples, screening and preservation of biological samples, and the collection of abiotic data. Recommendations are given for the sorting, identification, enumeration, and weighing of benthic specimens. The section on data analysis suggests indices for detecting changes in species composition, density, dispersion, diversity, richness, dominance, and spatial-temporal faunal homogeneity.

MORPHOLOGY

79-002593 Abraham, M.; Sandri, C.; Akert, K. FREEZE-ETCH STUDY OF THE TELEOSTEAN PITUITARY. Cell Tissue Res. 199 (3): 397-407. 17 July 1979. SFA 24(4)

[Dep. Zool., Hebrew Univ. Jerusalem, Jerusalem, Israel]

79-002594 Barss, W. H. AN ABNORMALLY PIGMENTED SHORTSPINE THORNYHEAD, /SEBASTOLOBUS ALASCANUS/ BEAN. Calif. Fish Game 65 (3): 168. July 1979. SFA 24(4)
[Oreg. Dep. Fish Wildl., Marine Science Dr., Newport 97365]

79-002595 Benjamin, M. THE CELL TYPES IN THE ADENOHYPOPHYSIS OF THE MARINE TELEOST /CRENILABRUS MELOPS/. Acta Zool. (Stockh.) 60 (2): 105-113. 1979. SFA 24(4)
[Dep. Anat., University College, Cardiff, Wales]

79-002596 Bird, D. J.; Eble, A. F. CYTOLOGY AND POLYSACCHARIDE CYTOCHEMISTRY OF THE GILL OF THE AMERICAN EEL, /ANGUILLA ROSTRATA/. Biol. Bull. (Woods Hole) 157 (1): 104-111. Aug. 1979. SFA 24(4)
[Dep. Biol., Northeastern Univ., Boston, MA 02115]

79-002597 Burton, D. SEXUAL DIMORPHISM IN THE INTEGUMENTARY TISSUES OF THREESPINE STICKLEBACK, /GASTEROSTEUS ACULEATUS/ FORM LEIURUS. Copeia 1979 (3): 533-535. 1 Aug. 1979. SFA 24(4)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

79-002598 Buynak, G. L.; Mohr, H. W., Jr. LARVAL DEVELOPMENT OF THE WHITE SUCKER (/CATOSTOMUS COMMERSONI/) FROM THE SUSQUEHANNA RIVER. Proc. Pa. Acad. Sci. 52 (2): 143-145. 1978. SFA 24(4)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603] White sucker (/Catostomus commersoni/) eggs hatched eight days after fertilization at a mean temperature of 14.3 C. Total length (TL) of newly hatched larvae ranged from 8.7 to 9.2 mm (mean = 8.9 mm); standard or notochord length ranged from 8.5 to 9.1 mm (mean = 8.7 mm). The newly hatched larvae were unpigmented, had pectoral fin buds, straight urostyles, and incomplete mouths. Transformation to the postlarval phase occurred by 14.4 mm TL and to the late postlarval phase by 17.9 mm TL. Useful characteristics for distinguishing white sucker larvae in the Susquehanna River are the straight urostyles, size, pigmentation patterns, and preanal myomere count.

79-002599 Buynak, G. L.; Mohr, H. W., Jr. LARVAL DEVELOPMENT OF THE SHORTHEAD REDHORSE (/MOXOSTOMA MACROLEPIDOTUM/) FROM THE SUSQUEHANNA RIVER. Trans. Am. Fish. Soc. 108 (2): 161-165. Mar. 1979. SFA 24(4)
[Ichthyological Assoc., Inc., R.D. 1, Berwick, PA 18603]

79-002600 Casteel, R. W. OTOLITHS AND SCALES OF MARINE CODS AND HAKE (PISCES: GADIDAE, MERLUCCIIDAE) FROM EASTERN PACIFIC WATERS OF CALIFORNIA, OREGON, WASHINGTON, AND BRITISH COLUMBIA. Zool. Anz. 202 (3-4): 219-225. 1979. SFA 24(4)
[Dep. Archaeol., Simon Fraser Univ., Burnaby, BC, Canada]

79-002601 Denoncourt, R. F.; Hocutt, C. H.; Stauffer, J. R., Jr.; Menendez, R. XANTHIC CREEK CHUB, /SEMOTILUS ATROMACULATUS/, FROM WEST VIRGINIA. Va. J. Sci. 29 (3): 188-190. 1978. SFA 24(4)
[Biol. Sci. Dep., York Coll. Pa. York 17405]

79-002602 Fujii, R.; Miyashita, Y. PHOTOELECTRIC RECORDING OF MOTILE RESPONSES OF FISH LEUCOPHORES. Annot. Zool. Jpn. 52 (2): 87-94. June 1979. SFA 24(4)
[Dep. Biol., Sapporo Med. Coll., Sapporo, Hokkaido 060, Japan]

79-002603 Hikita, T. [THE SPOTLESS RAINBOW TROUT (/SALMO GAIRDNERI/) COLLECTED IN THE NISHITTAPPU RIVER, SOUTHWESTERN COAST OF HOKKAIDO, JAPAN.] Sci. Rep. Hokkaido Salmon Hatchery No. 33. p. 75-78. Mar. 1979. In Japanese with English summ. SFA 24(4)

79-002604 Hossler, F. E.; Ruby, J. R.; McIlwain, T. D. THE GILL ARCH OF THE MULLET, /MUGIL CEPHALUS/. I. SURFACE ULTRASTRUCTURE. J. Exp. Zool. 208 (3): 379-398. June 1979. SFA 24(4)
[Dep. Anat., La. State Univ. Med. Cent., New Orleans 70119]

79-002605 Hossler, F. E.; Ruby, J. R.; McIlwain, T. D. THE GILL ARCH OF THE MULLET, /MUGIL CEPHALUS/. II. MODIFICATION IN SURFACE ULTRASTRUCTURE AND NA,K-ATPASE CONTENT DURING ADAPTATION TO VARIOUS SALINITIES. J. Exp. Zool. 208 (3): 399-406. June 1979. SFA 24(4)
[Dep. Anat., La. State Univ. Med. Cent,. New Orleans 70119]

79-002606 Hughes, G. M.; Munshi, J. S. D. FINE STRUCTURE OF THE GILLS OF SOME INDIAN AIR-BREATHING FISHES. J. Morphol. 160 (2): 169-194. May 1979. SFA 24(4)
[Res. Unit Comp. Anim. Respir., Bristol Univ., Woodland Rd., Bristol BS8 1UG, England]

79-002607 Hussain, S. M. RECORD OF A CLUPEOID FISH /NEMATALOSA NASUS/ WITHOUT AN ANAL FIN. Hydrobiologia 63 (2): 185-188. 2 Apr. 1979. SFA 24(4)
[Inst. Mar. Biol., Univ. Karachi, Karachi 32, Pakistan]

79-002608 Lethbridge, R. C.; Potter, I. C. THE ORAL FIMBRIAE OF THE LAMPREY /GEOTRIA AUSTRALIS/. J. Zool. (Lond.) 188 (2): 267-277. June 1979. SFA 24(4)
[Sch. Environ. Life Sci., Murdoch Univ., Murdoch, Western Australia]

79-002609 Maisey, J. G. FINSPINE MORPHOGENESIS IN SQUALID AND HETERODONTID SHARKS. Zool. J. Linn. Soc. 66 (2): 161-183. June 1979. SFA 24(4)
[Dep. Vert. Paleontol., Am. Mus. Nat. Hist., New York, NY 10024]

79-002610 Meunier, F. J. ETUDE HISTOLOGIQUE ET MICRORADIOGRAPHIQUE DU CARTILAGE HEMAL DE LA VERTEBRE DE LA CARPE, /CYPRINUS CARPIO/ L. (PISCES, TELEOSTEI, CYPRINIDAE). [HISTOLOGICAL AND MICRORADIOGRAPHICAL STUDIES OF THE HEMAL CARTILAGE OF THE VERTEBRAE OF THE CARP, /CYPRINUS CARPIO/ L. (PISCES, TELEOSTEI, CYPRINIDAE).] Acta Zool. (Stockh.) 60 (1): 19-31. 1979. In French with English summ. SFA 24(4)
[Lab. Anat. Comp., Univ. Paris VII, France]

79-002611 Miller, J. M.; Tucker, J. W., Jr. X-RADIOGRAPHY OF LARVAL AND JUVENILE FISHES. Copeia 1979 (3): 535-538. 1 Aug. 1979. SFA 24(4)
[Dep. Zool., N.C. State Univ., Raleigh 27650]

79-002612 Mishra, N. K.; Munnet, S. K. NUCLEAR BLEBS IN OOCYTES OF THE FISH /CLARIAS BATRACHUS/. Experientia (Basel) 35 (7): 867-868. 15 July 1979. SFA 24(4)
[Dep. Zool., Patna Univ., Patna, 800 005, India]

79-002613 Peek, W. D.; Youson, J. H. TRANSFORMATION OF THE INTERLAMELLAR EPITHELIUM OF THE GILLS OF THE ANADROMOUS SEA LAMPREY, /PETROMYZON MARINUS/ L., DURING METAMORPHOSIS. Can. J. Zool. 57 (6): 1318-1332. June 1979. In English with French summ. SFA 24(4)
[J. H. Youson: Dep. Zool., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada]

79-002614 Policansky, D.; Sieswerda, P. EARLY LIFE HISTORY OF THE STARRY FLOUNDER, /PLATICHTHYS STELLATUS/, REARED THROUGH METAMORPHOSIS IN THE LABORATORY. Trans. Am. Fish. Soc. 108 (3): 326-327. May 1979. SFA 24(4)
[Dep. Biol., Univ. Mass., Boston 02125]

79-002615 Takeuchi, I. K. APPLICATION OF MALACHITE GREEN-CONTAINING GLUTARALDEHYDE AS A FIXATIVE FOR ELECTRON MICROSCOPY OF XANTHOPHORES IN THE MEDAKA, A TELEOSTEAN FISH. J. Exp. Zool. 208 (3): 417-422. June 1979. SFA 24(4)
[Dep. Embryol., Inst. Dev. Res., Aichi Pref. Colony, Kasugai 480-03, Japan]

79-002616 Ueda, H.; Hirashima, T. ON TWO DIFFERENT TYPES OF PUTATIVE GONADOTROPHS IN THE PITUITARY GLAND OF THE MASU SALMON, /ONCORHYNCHUS MASOU/. Annot. Zool. Jpn. 52 (2): 114-124. June 1979. SFA 24(4)
[Dep. Biol., Fac. Fish., Hokkaido Univ., Minato-cho, Hakodate, Hokkaido 041, Japan]

79-002617 Van Utrecht, W. L. REMARKS ON THE ANATOMY AND ONTOGENY OF SCALES OF TELEOSTS. I. Aquaculture 17 (2): 159-174. June 1979. SFA 24(4)
[Inst. Taxon. Zool. (Zool. Mus.), Univ. Amsterdam, Amsterdam, The Netherlands] Densitometer records were made from the scales of a number of fish species, mainly from pikeperch. Analysis of the records showed that the pattern of hollows, representing the circuli in the curves, was very regular. No arrangement into groups of narrowly interspaced circuli could be demonstrated. It was therefore concluded that the circuli of the surface layer do not produce the "growth-checks". Ringlike structures were also present in the fibrous basal plate. These were about 3-5 um closer together than the circuli. These two circular gratings of slightly different inter-ring spacing will create an interference pattern, in this case a circular moire pattern, having no direct relation to the structures present in the two layers forming the scale.

79-002618 Wedekind, H. P. ELECTRON MICROSCOPIC STUDY OF THE GIANT CELLS IN THE OLFACTORY BULB OF LABYRINTH FISH (BELONTIIDAE, PERCIFORMES). Cell Tissue Res. 199 (3): 509-517. 17 July 1979. SFA 24(4)
[Paul-Ehrlich-Inst., Paul-Ehrlich-Strasse 42-448 D-6000 Frankfurt a.M, West Germany]

79-002619 Weisel, G. F. HISTOLOGY OF THE FEEDING AND DIGESTIVE ORGANS OF THE SHOVELNOSE STURGEON, /SCAPHIRHYNCHUS PLATORYNCHUS/. Copeia 1979 (3): 518-525. 1 Aug. 1979. SFA 24(4)
[Dep. Zool., Univ. Mont., Missoula 59812] The shovelnose sturgeon is well adapted for feeding and maintaining its potsition in fast flowing water on river bottoms. Taste buds are numercus on the papillose barbels, lips, gill rakers, and extend into the esophagus. The mouth is highly protractile with the upper jaw connected to a peculiar palatine apparatus that is, in effect, a tongue on the roof of the mouth. Arrangement of the viscera is similar to that of other sturgeon and to the paddlefish (/Polyodon spathula/), although the latter is a plankton feeder. Some unusual features of the gut of shovelnose sturgeon are the elongated esophagus, the connection of the pneumatic duct to the proximal segment of the stomach, and the incorporation of patches of pancreatic tissue into the wall of the intestine. The anterior pancreatic tissue interdigitates with liver tissue. The sparsity of lymph nodules in the gut is attributed to the slight degree of parasitic infestation.

79-002620 Werkheiser, E.; Dickinson, W. UNIQUE ANOMALY IN /ICTALURUS NEBULOSUS/. Proc. Pa. Acad. Sci. 52 (2): 157-160. 1978. SFA 24(4)
[Dep. Computer Sci., Pa. State Univ., Beaver Campus, Monaca, PA 15061]

79-002621 Willemse, J. J. GUIDE TO THE INTERNAL MORPHOLOGY OF THE EUROPEAN EEL, /ANGUILLA ANGUILLA/ (L.) (PISCES, TELEOSTEI). Aquaculture 17 (2): 91-103. June 1979. SFA 24(4)
[Dep. Anat., Erasmus Univ., P.O. Box 1738, 3000 DR Rotterdam, The Netherlands] Morphological detail and topographical relationships of internal organs of the European eel are demonstrated by labelled photographs of microscopical sections and drawings of dissected material. Glass eels were used in the preparation of sections of the head. Blocks were selected from the trunk region of a 35 cm eel. They were sectioned in transverse planes, resulting in a series of complete transverse sections through this region of the body. The macroscopical dissections were made on 50 cm silver eels.

79-002622 Willemse, J. J.; De Ruiter, A. A QUANTITATIVE IDENTIFICATION OF FOUR TYPES OF FIBRES IN THE LATERAL MUSCULATURE OF IMMATURE EUROPEAN EEL, /ANGUILLA ANGUILLA/ (L.) (PISCES, TELEOSTEI). Aquaculture 17 (2): 105-111. June 1979. SFA 24(4)
[Dep. Anat., Erasmus Univ., P.O. Box 1738, 3000 DR Rotterdam, The Netherlands] The ATP-ase activity and mitochondrial density of muscle fibres in the lateral musculature of immature European eels, /Anguilla anguilla/ (L.), were examined. The quantitative results show that in the peripheral (superficial) complex of 'red' fibres as well as in the deep 'white' fibre complexes small numbers of 'displaced' fibres occur. These displaced fibres are localized directly adjacent to both sides of the fascia separating the red and white fibre complexes, and their general appearance is white in the red fibre complex and red in the white fibre complex. The displaced fibres form neither a distinct

79-002622 CONTINUED
intermediate group separated from red and white fibres, nor one transitional group simply filling the gap between red and white.

79-002623 Yoshizaki, K.; Tamura, T. ULTRASTRUCTURE OF THE SKIN OF MORMYRID FISH, WITH SPECIAL REFERENCE TO THE MELANOPHORES. Bull. Jpn. Soc. Sci. Fish. 45 (3): 305-311. Mar. 1979. SFA 24(4)
[Fish. Lab., Fac. Agric., Nagoya Univ., Nagoya 464, Japan]

79-002624 Youson, J. H.; Ooi, E. C. DEVELOPMENT OF THE RENAL CORPUSCLE DURING METAMORPHOSIS IN THE LAMPREY. Am. J. Anat. 155 (2): 201-222. June 1979. SFA 24(4)
[Dep. Zool., Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada]

79-002625 Zander, C. D. MORPHOLOGIE VON HAUTSTRUKTUREN IM KOPFBEREICH DER GRUNDEL /PARAGOBIODON ECHINOCEPHALUS/ (RUPPELL) (GOBIIDAE, PISCES). [MORPHOLOGY OF SKIN STRUCTURES IN THE HEAD REGION OF /PARAGOBIODON ECHINOCEPHALUS/ (RUPPELL) (GOBIIDAE, PISCES).] Zool. Anz. 202 (3-4): 226-234. 1979. In German with English summ. SFA 24(4)
[Zool. Inst., Univ. Hamburg, West Germany]

PHYSIOLOGY

79-002626 Asahara, M.; Matsuno, S.; Matsumori, S. [CAROTENOID PIGMENTS OF RED TILEFISH.] Bull. Jpn. Soc. Sci. Fish. 45 (4): 485-492. Apr. 1979. In Japanese with English summ. SFA 24(4)
[Yamaguchi Pref. Gaikai Fish. Exp. Stn., Nagato 759-41, Japan]

79-002627 Asakawa, M. SIALIC ACID-CONTAINING GLYCOPROTEIN IN THE EXTERNAL MUCUS OF EEL, /ANGUILLA JAPONICA/ TEMMINCK ET SCHLEGEL--IV. ISOLATION AND SOME PROPERTIES OF THE CARBOHYDRATE MOIETY. Bull. Jpn. Soc. Sci. Fish 45 (5): 601-604. May 1979. SFA 24(4)
[Fac. Educ., Kumamoto Univ., Kumamoto 860, Japan]

79-002628 Atkins, D. L.; Fink, W. L. MORPHOLOGY AND HISTOCHEMISTRY OF THE CAUDAL GLAND OF /CORYNOPOMA RIISEI/ GILL. J. Fish Biol. 14 (5): 465-469. May 1979. SFA 24(4)
[Dep. Biol. Sci., George Washington Univ., Washington, DC 20052]
Males of the South American freshwater fish, /Corynopoma riisei/, have glandular masses on the caudal peduncle and fin which are partly enclosed by a scale-covered pouch. Histochemical examination reveals an extensive layer of large secretory cells superficial to the dermis appearing similar in form to typical mucous cells. PAS and Alcian blue staining indicate all cells produce muco- and/or glycoproteins and that a few cells are also synthesizing mucopolysaccharides. This secretion probably acts as a pheromone during courtship to stimulate or release female sexual response.

79-002629 Babiker, M. M.; El Hakeem, O. H. CHANGES IN BLOOD CHARACTERISTICS AND CONSTITUENTS ASSOCIATED WITH AESTIVATION IN THE AFRICAN LUNGFISH /PROTOPTERUS ANNECTENS/ OWEN. Zool. Anz. 202 (1/2): 9-16. 1979. SFA 24(4)
[Dep. Zool., Univ. Khartoum, Khartoum, Sudan]

79-002630 Bashamohideen, M.; Kunnemann, M. DIE WIRKUNG VON UMWELTBELASTUNGEN BEI DEM FISCH /IDUS IDUS/ L. (CYPRINIDAE). II. DER EINFLUSS VON TEMPERATURAENDERUNGEN AUF ATP, ADP, AMP UND ENERGIELADUNG IN MUSKEL UND GEHIRN. [RESPONSES OF THE FISH /IDUS IDUS/ L. (CYPRINIDAE) TO ENVIRONMENTAL LOAD. II. ATP, ADP, AMP, AND ENERGY CHARGE IN MUSCLE AND BRAIN.] Zool. Anz. 202 (3-4): 163-171. 1979. In German with English summ. SFA 24(4)
[Zool. Inst., Univ. Kiel, West Germany] In the range of the adaptation-temperature from 5° to 20°C there is a steady increase of energy charge in muscle and brain of the fish /Idus idus/ L. Above 20°C, however, energy charge decreases. The increase is explained by a capacity adaptation (compensation), the decrease is caused by the permanent load of temperatures higher than 20°C. A rapid change (1°/h) of the adaptation-temperature suppresses the capacity adaptation. This cannot be observed, when /Idus idus/ is subjected to a slow (0.5°/d) change.

79-002631 Beamish, F. W. H.; Potter, I. C.; Thomas, E. PROXIMATE COMPOSITION OF THE ADULT ANADROMOUS SEA LAMPREY, /PETROMYZON MARINUS/, IN RELATION TO FEEDING, MIGRATION AND REPRODUCTION. J. Anim. Ecol. 48 (1): 1-19. Feb. 1979. SFA 24(4)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] The large fluctuations in the proximate composition of the muscle, liver, gonad and whole body of various stages in the adult phase of the life cycle of the anadromous sea lamprey have been related to the feeding, migration and reproduction of the animal. Lipid levels were equivalent to only 1.3 percent of the animal's wet body weight at the end of the 10-month non-trophic period which follows the initiation of metamorphosis. The relative amount of lipid rose by approximately eight times during the subsequent freshwater and marine parasitic phase, before subsequently declining to 4 percent after the conclusion of the upstream migration and spawning. The data indicate that protein, as well as lipid, is extensively catabolized during the spawning period. The lipid content of the liver is much greater in male than female upstream migrants, whereas the reverse situation is found in the gonads. The increase in the weight of lipid in the ovary during the spawning migration corresponds to a value equivalent to approximately one half of the lipid reduction incurred by the whole animal. Values for glycogen levels in the muscle, liver and gonad vary markedly during the various stages in adult life.

79-002632 Bell, M. V.; Kelly, K. F.; Sargent, J. R. SODIUM ORTHOVANADATE, A POWERFUL VASOCONSTRICTOR IN GILLS OF THE COMMON EEL, /ANGUILLA ANGUILLA/. J. Mar. Biol. Assoc. U.K. 59 (2): 429-435. May 1979. SFA 24(4)
[Inst. Mar. Biochem., Aberdeen, Scotland] Sodium orthovanadate added internally is a powerful vasoconstrictor in perfused, irrigated gills of /Anguilla anguilla/. The anion is active at concentrations as low as 10^{-7} M and its action is antagonized by Beta-adrenergic vasodilators such as adrenaline and isoprenaline. These effects are discussed in terms of the known mode of action of vanadate as an inhibitor of $(Na^+ + K^+)$-dependent ATPase. The biological and pharmacological effects of naturally occurring vanadate are assessed.

79-002633 Bieniarz, K.; Epler, P.; Thuy, L-N.; Kogut, E. CHANGES IN THE OVARIES OF ADULT CARP. Aquaculture 17 (1): 45-68. May 1979. SFA 24(4)
[Agric. Acad., Inst. Appl. Zool., Al. Mickiewicza 24/28, Krakow, Poland]

79-002634 Bowen, S. H. A NUTRITIONAL CONSTRAINT IN DETRITIVORY BY FISHES: THE STUNTED POPULATION OF /SAROTHERODON MOSSAMBICUS/ IN LAKE SIBAYA, SOUTH AFRICA. Ecol. Monogr. 49 (1): 17-31. Mar. 1979. SFA 24(4)
[Dep. Biol. Sci., Mich. Technol. Univ., Houghton 49931] Juvenile /Sarotherdon mossambicus/ in Lake Sibaya, South Africa, Grow rapidly and maintain good body condition, but adults grow slowly, show extensive marasmas and appear to suffer from severe malnutrition. The cause of this malnutrition was sought by comparison of juvenile and adult diets. Juveniles feed on benthic detrital aggregate from nearshore sand terraces, whereas adults feed on benthic detrital aggregate in deeper offshore waters. Chemical analysis of 39 benthic detrital aggregate samples collected from juvenile and adult feeding areas showed that detrital aggregate from these 2 areas did not differ in caloric content (mean = 0.97 J/mg organic), organic content (mean = 43.0 percent), soluble carbohydrate content (mean = 16.0 percent of organic), or total carbohydrate content (mean = 45.7 percent of organic). Protein content ranged from 1.8 to 14.2 percent of organic matter and decreased with increasing depth. Assimilation efficiencies determined experimentally for juveniles feeding on benthic detrital aggregate were: energy 42 percent, organic matter 37 percent, soluble carbohydrate 36 percent, total carbohydrate 35 percent, and protein 46 percent. A large proportion of the organic matter assimilated was nonliving amorphous detritus. Ratios of digestible protein to digestible energy calculated for the 39 samples show a highly significant inverse relationship to increasing depth. These ratios indicate that juvenile diets contain adequate protein to support good growth, but adult diets would be expected to result in malnutrition due to protein deficiency. Nutritional constraints imposed by low protein levels in detrital aggregate account for the characteristic nearshore distribution of detritivorous fishes and the paucity of exclusively detritivorous fish species.

79-002635 Casselman, J. M. CALCIFIED TISSUE AND BODY GROWTH OF NORTHERN PIKE, /ESOX LUCIUS/ LINNAEUS. Ph.D. dissertation, Univ. Toronto 1978. From Diss. Abstr. Int. B Sci. Eng. 40(2):628. Aug. 1979. SFA 24(4)
Growth of calcified tissue, which is protein dependent, is influenced by any factor that intrinsically or extrinsically affects protein metabolism. Changes in the configuration of circuli on scales and in the translucency of other calcified structures of fishes are produced by changes in appositional growth and calcification rates.--From abstr.

79-002636 Cech, J. J., Jr.; Mitchell, S. J.; Massingill, M. J. RESPIRATORY ADAPTATIONS OF SACRAMENTC BLACKFISH, /ORTHODON MICROLEPIDOTUS/ (AYRES), FOR HYPOXIA. Comp. Biochem. Physiol. A Comp. Physiol. 63 (3): 411-415. 1979. SFA 24(4)
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79-002637 Cech, J. J., Jr.; Campagna, C. G.; Mitchell, S. J. RESPIRATORY RESPONSES OF LARGEMOUTH BASS (/MICROPTERUS SALMOIDES/) TO ENVIRONMENTAL CHANGES IN TEMPERATURE AND DISSOLVED OXYGEN. Trans. Am. Fish. Soc. 108 (2): 166-171. Mar. 1979. SFA 24(4)
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79-002638 Chambers, J. E.; Yarbrough, J. D. A SEASONAL STUDY OF MICROSOMAL MIXED-FUNCTION OXIDASE COMPONENTS IN INSECTICIDE-RESISTANT AND SUSCEPTIBLE MOSQUITOFISH, /GAMBUSIA AFFINIS/. Toxicol. Appl. Pharmacol. 48 (3): 497-507. May 1979. SFA 24(4)
[Dep. Biol. Sci., Miss. State Univ., Mississippi State 39762]

79-002639 Christiansen, J. A. CHANGES IN PHOSPHOLIPIDS AND FATTY ACIDS DURING TEMPERATURE ACCLIMATION OF GREEN SUNFISH (/LEPOMIS CYANELLUS/ R.). Ph.D. dissertation, Univ. Ill. 139p. 1978. From Diss. Abstr. Int. B Sci. Eng. 40(1):97. July 1979. SFA 24(4)

79-002640 Clayton, R. M.; Maughan, O. E. SUBLETHAL THERMAL SHOCK EFFECTS ON PREDATION SUSCEPTIBILITY OF FATHEAD MINNOWS. Va. J. Sci. 29 (3): 191-193. 1978. SFA 24(4)
[VPI&SU Coop. Ext. Serv., Hampton, VA 23669] Fathead minnows (/Pimephales promelas/) acclimated at 18°C in a laboratory holding tank were exposed to 32°C for 85 minutes twice daily for 6.5 days. No significant differences in activity or avoidance of largemouth bass (/Micropterus salmoides/) were found between control and test fish. Apparently, the minnow became acclimated to the recurring thermal stress. If this hypothesis is correct, the establishment of thermal standards based on thermal resistance after laboratory acclimation of test fish to a single temperature does not accurately reflect the natural thermal capabilities of this species.

79-002641 Colin, D. A.; Kirsch, R.; Leray, C. HAEMODYNAMIC EFFECTS OF ADENOSINE ON GILLS OF THE TROUT (/SALMO GAIRDNERI/). J. Comp. Physiol. B. Biochem. Syst. Environ. Physiol. 130 (4): 325-330. 1979. SFA 24(4)
[Lab. Physiol. Comp., C.N.R.S., B.P. 20 CR, F-67037 Strasbourg Cedex, France]

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[Lab. Biol. Technol. Membranes, Univ., Claude Bernard-Lyon 1, 69621 Villeurbanne, France]

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[Dep. Zool., Univ. North Wales, Bangor, Gwynedd, Wales]

79-002645 Dannevig, B. H.; Norum, K. R. ESTERIFICATION OF CHOLESTEROL IN FISH PLASMA: STUDIES ON THE CHOLESTEROL ESTERIFYING ENZYME IN PLASMA OF CHAR (/SALMO ALPINUS/ L.). Comp. Biochem. Physiol. B Comp. Biochem. 63 (4): 537-541. 1979. SFA 24(4)
[Inst. Zoophysiol., Univ. Oslo, Blindern, Oslo 3, Norway]

79-002646 Davenport, J.; Vahl, O.; Lonning, S. COLD RESISTANCE IN THE EGGS OF THE CAPELIN /MALLOTUS VILLOSUS/. J. Mar. Biol. Assoc. U.K. 59 (2): 443-453. May 1979. SFA 24(4)
[N.E.R.C. Unit Mar. Invest. Biol., Mar. Sci. Lab., Menai Bridge, Gwynedd, Wales] Eggs of the capelin, /Mallotus villosus/, are laid superficially on sandy beaches where they may be exposed to temperatures below -5°C during tidal emersion. The eggs do not freeze until the temperature of their surroundings falls to a mean of -11.9°C for eggs at the late blastula stage and -10.6°C for eggs about to hatch, even though films of sea water covering the eggs are frozen. Newly hatched capelin larvae freeze at a mean temperature of -2.5°C when the sea water surrounding them freezes, and are probably supercooled at temperatures below this before hatching. Evidence is presented which demonstrates that capelin eggs survive low temperatures by supercooling, and that they can do so in the presence of external ice crystals because the chorion prevents ice penetration and hence seeding of the eggs' internal fluids. The chorion of /Mallotus/ is shown to possess an extra secondary layer, like that of the related smelts. The primary function of this outer layer appears to be concerned with adhesion to sand grains but it seems likely that it also prevents or delays ice penetration.

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[V. de Vlaming: Dep. Biol., Marquette Univ., Milwaukee, WI 53233]

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[Dep. Zool., Univ. Khartoum, Khartoum, Sudan]

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[Dep. Biol., Univ. Miami, Coral Gables, FL 33124]

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[Inst. Vitamin Res., Dir. Fish., P.O. Box 187, N-5001 Bergen, Norway]

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[Biol. Dep., Univ. New Brunswick, Fredricton, NB, Canada]

79-002653 Folmar, L. C.; Dickhoff, W. W. PLASMA THYROXINE AND GILL NA -K ATPASE CHANGES DURING SEAWATER ACCLIMATION OF COHO SALMON, /ONCORHYNCHUS KISUTCH/. Comp. Biochem. Physiol. A Comp. Physiol. 63 (3): 329-332. 1979. SFA 24(4)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

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[Lab. Anat. Comp., Inst. Biol. Anim., Univ. Bordeaux I, 33405 Talence Cedex, France]

79-002655 Gallis, J. L.; Belloc, F.; Lasserre, P.; Boisseau, J. FRESHWATER ADAPTATION IN THE EURYHALINE TELEOST, /CHELON LABROSUS/. II. EFFECTS OF CONTINUANCE OF ADAPTATION, CORTISOL TREATMENT, AND ENVIRONMENTAL CALCIUM ON WATER INFLUX IN ISOLATED GILL. Gen. Comp. Endocrinol. 38 (1): 11-20. May 1979. SFA 24(4)
[Lab. Anat. Comp. Embryog., Univ. Bordeaux I, 33405 Talence Cedex, France]

79-002656 Geraudie, J.; Singer, M. NERVE DEPENDENT MACROMOLECULAR SYNTHESIS IN THE PECTORAL FIN REGENERATE OF THE FISH, /FUNDULUS/. J. Exp. Zool. 208 (3): 281-286. June 1979. SFA 24(4)
[Comp. Anat. Lab., Univ. Paris VII, 2 Place Jussieu, 75005-Paris, France]

79-002657 Gesser, H.; Poupa, O. EFFECTS OF DIFFERENT TYPES OF ACIDOSIS AND CA^2 ON CARDIAC CONTRACTILITY IN THE FLOUNDER (/PLEURONECTES FLESUS/). J. Comp. Physiol. B Biochem. Syst. Environ. Physiol. 131 (4): 293-296. 5 July 1979. SFA 24(4)
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[Inst. Fish. Technol. Res., 9000 Tromso, Norway]

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[Dep. Anat., N.J. Med. Sch., Newark 07103]

79-002660 Grove, D. J.; Campbell, G. THE ROLE OF EXTRINSIC AND INTRINSIC NERVES IN THE CO-ORDINATION OF GUT MOTILITY IN THE STOMACHLESS FLATFISH /RHOMBOSOLEA TAPIRINA/ AND /AMMOTRETIS ROSTRATA/ GUENTHER. Comp. Biochem. Physiol. C Comp. Pharmacol. 63 (1): 143-159. 1979. SFA 24(4)
[Mar. Sci. Lab., Menai Bridge, Gwynedd, Wales]

79-002661 Gruber, D.; Cairns, J., Jr.; Dickson, K. L.; Hendricks, A. C. A CINEMATOGRAPHIC INVESTIGATION INTO THE FISH'S BIOELECTRIC BREATHING SIGNAL. J. Fish Biol. 14 (5): 429-436. May 1979. SFA 24(4)
[Cent. Environ. Stud., VPI&SU, Blacksburg, VA 24061] The buccal-ventilatory movements of bluegill sunfish, /Lepomis macrochirus/ and fathead minnows /Pimephales promelas/ and strip chart recordings of these movements were filmed simultaneously. The amplitudes of the ventilatory signals were greatest when fish was perpendicular to the plane of either electrode, and the polarity of a signal corresponded to the fish's direction to one of the electrodes. The most common breathing waveforms for both species reflected a bimodal pattern. These patterns varied in frequency and shifted toward single modality in response to stress. Portions of the recorded waveforms consistently coincided with the period in which a fish was displaying either full opercular flare or closure. Similar occurrences corresponded with mouth positions. Several commonly occurring variations of the ventilatory signal waveforms are presented, including the response of bluegill sunfish to a strong concentration of chlorinated water.

79-002662 Grun, G. LIGHT-INDUCED ACCELERATION OF RETINA DEVELOPMENT IN A MOUTH-BROODING TELEOST. J. Exp. Zool. 208 (3): 291-302. June 1979. SFA 24(4)
[Lehrstuhl Spez. Zool., Ruhr-Univ. Bochum, D 4630 Bochum 1, West Germany]

79-002663 Guggino, W. B. THE ONTOGENY OF OSMOREGULATION IN TWO SPECIES OF KILLIFISHES, /FUNDULUS HETEROCLITUS/ AND /FUNDULUS BERMUDAE/. Ph.D. dissertation, Univ. N.C. 132p. 1978. From Diss. Abstr. Int. B Sci. Eng. 40(1):115. July 1979. SFA 24(4)

79-002664 Hamor, T.; Garside, E. T. HOURLY AND TOTAL OXYGEN CONSUMPTION BY OVA OF ATLANTIC SALMON, /SALMO SALAR/ L., DURING EMBRYOGENESIS, AT TWO TEMPERATURES AND THREE LEVELS OF DISSOLVED OXYGEN. Can. J. Zool. 57 (6): 1196-1200. June 1979. In English with French summ. SFA 24(4)
[E. T. Garside, Dep. Biol., Dalhousie Univ., Halifax, NS B3H 4J1, Canada] Weighted mean hourly rates of oxygen consumption in embryonated ova of Atlantic salmon, /Salmo salar/ L., during embryogenesis, were reduced significantly by levels of dissolved oxygen below air saturation and by a temperature of 5°C, relative to those for ova incubated at 10°C. Total oxygen consumption during embryogenesis also was reduced significantly by the lower levels of dissolved oxygen, but not by temperature. The decrease in the pace of embryogenesis in the lots of ova at 5°C extended the developmental time so that the lower rate of oxygen uptake was offset. Thus, within each level of dissolved oxygen there was no appreciable difference in the products of time units and units of oxygen uptake. At 5°C, 100 percent air saturation, mean hourly uptake was 0.0141 mg O(2)/ovum, and total uptake was 28.153 mg O(2)/ovum. At 10°C, 100 percent air saturation, these values were 0.0270 mg O(2)/cvum, and 27.974 mg O(2) /ovum, respectively. Values for ova incubated at 50 and 30 percent air saturation were correspondingly lower.

79-002665 Hansen, H. J. M.; Abraham, S. THE INFLUENCE OF ENVIRONMENTAL SALINITY, TEMPERATURE, IONIZING IRRADIATION AND YELLOW OR SILVER STAGE ON LIPID METABOLISM IN THE GILLS OF THE EUROPEAN EEL (/ANGUILLA ANGUILLA/). Comp. Biochem. Physiol. B Comp. Biochem. 63 (4): 483-490. 1979. SFA 24(4)
[Riso Natl. Lab., 400 Rockilde, Denmark]

79-002666 Haswell, M. S. CO(2) EXCRETION AND ACID-BASE REGULATION IN THE RAINBOW TROUT, /SALMO GAIRDNERI/. Ph.D. dissertation, Univ. British Columbia 1978. From Diss. Abstr. Int. B Sci. Eng. 39(12, part 1):5795. June 1979. SFA 24(4)

79-002667 Hazel, J. R.; Sellner, P. A. FATTY ACID AND STEROL SYNTHESIS BY HEPATOCYTES OF THERMALLY ACCLIMATED RAINBOW TROUT (/SALMO GAIRDNERI/). J. Exp. Zool. 209 (1): 105-114. July 1979. SFA 24(4)
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[Fac. Fish., Mie Univ., Tsu, Mie 514, Japan]

79-002669 Hilton, J. W.; Cho, C. Y.; Brown, R. G.; Slinger, S. J. THE SYNTHESIS, HALF-LIFE AND DISTRIBUTION OF ASCORBIC ACID IN RAINBOW TROUT. Comp. Biochem. Physiol. A Comp. Physicl. 63 (3): 447-453. 1979. SFA 24(4)
[Dep. Nutr., Univ. Guelph, Guelph, ON N1G 2W1, Canada]

79-002670 Hofer, R. THE ADAPTATION OF DIGESTIVE ENZYMES TO TEMPERATURE, SEASON AND DIET IN ROACH, /RUTILUS RUTILUS/ L. AND RUDD /SCARDINIUS ERYTHROPHTHALMUS/ L. 1. AMYLASE. J. Fish Biol. 14 (6): 565-572. June 1979. SFA 24(4)
[Inst. Zoophysiol., Univ. Innsbruck, Austria]

79-002671 Houston, A. H.; Smeda, J. S. THERMOACCLIMATORY CHANGES IN THE IONIC MICROENVIRONMENT OF HAEMOGLOBIN IN THE STENOTHERMAL RAINBOW TROUT (/SALMO GAIRDNERI/) AND EURYTHERMAL CARP (/CYPRINUS CARPIO/). J. Exp. Biol. 80: 317-340. June 1979. SFA 24(4)
[Dep. Biol. Sci., Brock Univ., St Catharines, ON L2S 3A1, Canada]

79-002672 Hurk, R. van den; Peute, J. CYCLIC CHANGES IN THE OVARY OF THE RAINBOW TROUT, /SALMO GAIRDNERI/, WITH SPECIAL REFERENCE TO SITES OF STEROIDOGENESIS. Cell Tissue Res. 199 (2): 289-306. 21 June 1979. SFA 24(4)
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79-002673 Imada, K. [STUDIES ON THE VERTEBRAL MALFORMATION OF FISHES. IV. HISTOLOGICAL OBSERVATION ON THE REPAIR OF FRACTURED GOLDFISH (/CARASSIUS AURATUS/) EXPOSED TO NAC.] Sci. Rep. Hokkaido Fish Hatchery 33: 75-87. Dec. 1978. In Japanese with English summ. SFA 24(4)
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79-002674 Ince, B. W. INSULIN SECRETION FROM THE /IN SITU/ PERFUSED PANCREAS OF THE EUROPEAN SILVER EEL, /ANGUILLA ANGUILLA/ L. Gen. Comp. Endocrinol. 37 (4): 533-540. Apr. 1979. SFA 24(4)
[Dep. Zool. Comp. Physiol., Queen Mary Coll., Mile End Rd., London E1 4NS, England]

79-002675 Isaia, J.; Payan, P.; Girard, J.-P. A STUDY OF THE WATER PERMEABILITY OF THE GILLS OF FRESHWATER- AND SEAWATER-ADAPTED TROUT (/SALMO GAIRDNERI/): MODE OF ACTION OF EPINEPHRINE. Physiol. Zool. 52 (3): 269-279. July 1979. SFA 24(4)
[Lab. Physiol. Anim., Fac. Sci., 06034 Nice Cedex, France]

79-002676 Itazawa, Y.; Takeda, T. AN ESTIMATION OF THE MINIMUM LEVEL OF DISSOLVED OXYGEN IN WATER REQUIRED FOR NORMAL LIFE OF FISH--II. AN EXPERIMENT WITH CARP UNDER CARBON DIOXIDE ACCUMULATION. Bull. Jpn. Soc. Sci. Fish. 45 (3): 323-327. Mar. 1979. SFA 24(4)
[Dep. Fish., Fac. Agric., Kyushu Univ. 46-04, Hakozaki, Higashi-ku, Fukuoka 812, Japan] Dissolved oxygen in ambient water is considered to have effects on fish life through the influence on oxygen level in the arterial blood. The minimum requirement of ambient oxygen for carp is, based on this idea, estimated to be 70-80 mmHg in partial pressure or 45-55 percent in percent saturation, from the minimum level of ambient oxygen required for maintenance of normal levels of partial pressure, percent saturation and estimated concentration of oxygen in the arterial blood.

79-002677 Jafri, S. I. H.; Ensor, D. M. CCCURRENCE OF AN INTERSEX CONDITION IN THE ROACH /RUTILUS RUTILUS/ (L). J. Fish Biol. 14 (6): 547-549. June 1979. SFA 24(4)

[Dep. Zool., Univ. Liverpool., P.O. Box 147, Liverpool L69 3BX, England] The roach, /Rutilus rutilus/, is normally a dioecius species. During an experimental study of reproduction in this species, a condition of apparently functional intersex was discovered. Anatomically the gonad was a testis, exhibiting various normal stages of spermatogenesis. A group of oocytes was found during the microscopical examination of the gonad, interspersed between lobules of normal testicular tissue. A few small occytes were found to be in the chromatin-Nucleolus stage, while the rest were in the perinucleolus stage. In addition, some large oocytes with an average diameter of 40 um were randomly distributed among the lobules of the testis.

79-002678 Jobling, M.; Davies, P. S. GASTRIC EVACUATION IN PLAICE, /PLEURONECTES PLATESSA/ L.: EFFECTS CF TEMPERATURE AND MEAL SIZE. J. Fish Biol. 14 (6): 539-546. June 1979. SFA 24(4)

[Inst. Fiskerifag, Univ. Tromso, Tromso, Norway] The pattern of gastric evacuation in the plaice can be described by a single curve of curvilinear form, relating the amount of food remaining in the stomach and the post-prandial time. This curve can be transformed to linear form, conforming to a volume dependent model of evacuation. This allows the calculation of the time for complete evacuation of the stomach. The shape of the gastric evacuation curve is unchanged by the size of the meal fed. With increase in temperature however, the form of the curve does change, resulting in shorter times for complete evacuation.

79-002679 Johansson-Sjobeck, M.-L. THE EFFECTS OF SPLENECTOMY ON THE HEMATOLOGY AND ON THE ACTIVITY OF DELTA-AMINOLEVULINIC ACID DEHYDRATASE (ALA-D) IN HEMATOPOIETIC TISSUES OF THE EUROPEAN EEL, /ANGUILLA ANGUILLA/ L. Comp. Biochem. Physiol. A Comp. Physiol. 63 (3): 333-338. 979. SFA 24(4)

[Dep. Zoophysiol., Univ. Goteborg, Fack S-400 33 Goteborg, Sweden] The effects of splenectcmy on hematological parameters and on the activity of ALA-D in some tissues of the European eel, /Anguilla anguilla/ L., were studied after 1, 2, 4, 6 and 13 weeks. No marked differences in red blood cell varibles (hematocrit, hemoglobin and RBC count) or enzyme activity were observed between sham-operated and splenectomized eels. An initial lymphopenia followed later by neutrophilia were observed in both operated groups. Abnormal erythrocytes were present in the blood from splenectomized eels. The spleen seems to function primarily as an erythrocyte reservoir and destruction organ for erythrocytes and has only a subsidiary role as an erythrocyte-producing organ. Lymphocytopoiesis seems to occur partly in the spleen, while granulocytopoiesis probably occurs elsewhere.

79-002680 Kavaliers, M. PINEAL INVOLVEMENT IN THE CONTROL OF CIRCADIAN RHYTHMICITY IN THE LAKE CHUB, /COUESIUS PLUMBEUS/. J. Exp. Zool. 209 (1): 33-40. July 1979. SFA 24(4)

[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523] Removal of the pineal organ from the lake chub, /Couesius plumbeus/, had significant effects on circadian locomotor activity. In fish kept in continuous darkness the absolute length of the circadian period was significantly altered; the variability of the period was increased; and ultradian rhythms were eliminated. These findings indicate that the pineal organ is involved in the control of circadian rhythmicity

79-002680 CONTINUED
in this teleost fish.

79-002681 Kayama, M.; Mankura, M.; Dalimunthe, D. COMPARATIVE BIOCHEMICAL STUDIES ON PLASMA CHOLESTEROL--I. ACTIVITY OF CARP PLASMA LECITHIN: CHOLESTEROL ACYLTRANSFERASE. Bull. Jpn. Soc. Sci. Fish. 45 (4): 523-525. Apr. 1979. SFA 24(4)
[Lab. Mar. Biochem., Fac. Fish. Anim. Husb., Hiroshima Univ., Fukuyama 720, Japan]

79-002682 Klar, G. T.; Stalnaker, C. B.; Farley, T. M. COMPARATIVE PHYSICAL AND PHYSIOLOGICAL PERFORMANCE OF RAINBOW TROUT, /SALMO GAIRDNERI/, OF DISTINCT LACTATE DEHYDROGENASE B^2 PHENOTYPES. Comp. Biochem. Physiol. A Comp. Physiol. 63 (2): 229-235. 1979. SFA 24(4)
[Utah Coop. Fish. Res. Unit, Utah State Univ., Logan 84322] Adult rainbow trout (/Salmo gairdneri/) LDH $B^{2''}B^{2''}$ phenotype exhibited lower swimming performance at low ambient oxygen levels than $B^{2'}B^{2'}$ and $B^{2''}B^{2''}$ phenotypes. Under decreasing oxygen conditions the oxygen consumption rate and ambient oxygen concentration at fatigue for the $B^{2''}B^{2''}$ females was significantly higher than $B^{2'}B^{2'}$ females for the former and all other male and female phenotypes for the latter. Blood /p/O(2) at fatigue under low ambient oxygen conditions was significantly higher for females than males.

79-002683 Klar, G. T.; Stalnaker, C. B.; Farley, T. M. COMPARATIVE BLOOD LACTATE RESPONSE TO LOW OXYGEN CONCENTRATIONS IN RAINBOW TROUT, /SALMO GAIRDNERI/, LDH B^2 PHENOTYPES. Comp. Biochem. Physiol. A Comp. Physiol. 63 (2): 237-240. 1979. SFA 24(4)
[Utah Coop. Fish. Res. Unit, Utah State Univ., Logan 84322] The slope for the regression of blood lactate concentrations on exposure time to 2 mg/l. ambient oxygen levels was significantly lower for the adult rainbow trout (/Salmo gairdneri/) LDH $B^{2'}B^{2'}$ phenotype than the $B^{2''}B^{2''}$ phenotype. Significant differences were observed in resting blood lactate concentrations among the $B^{2'}B^{2'}$, $B^{2'}B^{2''}$, and $B^{2''}B^{2''}$ phenotypes. Significant mortality after a 60 min exposure to 2 mg/l. ambient oxygen was observed for the $B^{2''}B^{2''}$ phenotype. A relationship of the kinetic properties of the $B(4)^{2''}$ isozyme to lactate metabolism has been proposed to explain the mortality and poor low oxygen swimming performance of the $B^{2''}B^{2''}$ phenotype.

79-002684 Korsgaard, B.; Petersen, I. VITELLOGENIN, LIPID AND CARBOHYDRATE METABOLISM DURING VITELLOGENESIS AND PREGNANCY, AND AFTER HORMONAL INDUCTION IN THE BLENNY /ZOARCES VIVIPARUS/ (L.). Comp. Biochem. Physiol. B Comp. Biochem. 63 (2): 245-251. 1979. SFA 24(4)
[Inst. Biol., Odense Univ., DK-5230 Odense M, Denmark] Ovarian vitellogenic growth in /Zoarces viviparus/ lasts about 2 months. Vitellogenesis is immediately followed by ovulation, fertilization and a pregnancy period of 4 months. Vitellogenin is observed in the blood during vitellogenesis, but declines during the first month of pregnancy. The largest amount of liver lipid is found before vitellogenesis is initiated. During pregnancy the liver is depleted of lipid and glycogen, and total lipid and phospholipid is accumulating in the blood. Estradiol treatment during pregnancy results in a dose-dependent increase in vitellogenin and lipids of the blood. In late pregnancy, birth can be provoked with progesterone alone, or with combined progesterone and estradiol treatment.

79-002685 Kudoh, S. [LIPID METABOLISM OF LARVAL FISH.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 85-99. 1976[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka-ken, Japan]

79-002686 Kunnemann, H.; Precht, H. THE INFLUENCE OF ENVIRONMENTAL TEMPERATURE AND SALINITY ON ANIMALS. I. POIKILOTHERMIC ANIMALS AND THE NORMAL RANGE OF TEMPERATURE. Zool. Anz. 202 (3-4): 145-153. 1979. In English with German summ. SFA 24(4)
[Zool. Inst., Univ. Kiel, West Germany]

79-002687 Kunnemann, H.; Precht, H. THE INFLUENCE OF ENVIRONMENTAL TEMPERATURE AND SALINITY ON ANIMALS. II. RESISTANCE OF POIKILOTHERMIC ANIMALS TO HEAT AND COLD. Zool. Anz. 202 (3-4): 154-162. 1979. In English with German summ. SFA 24(4)
[Zool. Inst., Univ. Kiel, West Germany]

79-002688 Langer, M.; Van Noorden, S.; Polak, J. M.; Pearse, A. G. E. PEPTIDE HORMONE-LIKE IMMUNOREACTIVITY IN THE GASTROINTESTINAL TRACT AND ENDOCRINE PANCREAS OF ELEVEN TELEOST SPECIES. Cell Tissue Res. 199 (3): 493-508. 17 July 1979. SFA 24(4)
[Kleiststr. 3, 2300 Kiel 1, West Germany]

79-002689 Leach, G. J. THE EFFECTS OF CORTISOL AND STRESS ON CARBOHYDRATE AND PROTEIN METABOLISM IN /FUNDULUS HETEROCLITUS/. Ph.D. dissertation, Univ. Del. 134p. 1979. From Diss. Abstr. Int. B Sci. Eng. 39(12, part 1):5782. June 1979. SFA 24(4)

79-002690 Leger, C.; Ducruet, V.; Flanzy, J. LIPASE ET COLIPASE DE LA TRUITE ARC-EN-CIEL. QUELQUES RESULTATS RECENTS. [LIPASE AND COLIPASE IN THE RAINBOW TROUT: SOME RECENT RESULTS.] Ann. Biol. Anim. Biochim. Biophys. 19 (3): 825-832. 1979. In French with English summ. SFA 24(4)
[Stn. Rech. Nutr., I.N.R.A., 78350 Jouy-en-Josas, France]

79-002691 Lidman, U.; Dave, G.; Johansson-Sjobeck, M.-L.; Larsson, A.; Lewander, K. METABOLIC EFFECTS OF CORTISOL IN THE EUROPEAN EEL, /ANGUILLA ANGUILLA/ (L.). Comp. Biochem. Physiol. A Comp. Physiol. 63 (3): 339-344. 1979. SFA 24(4)
[Dep. Zoophysiol., Univ. Goteborg, Fack S-400 33 Goteborg, Sweden]

79-002692 Loretz, C. A. SOME EFFECTS OF OVINE PROLACTIN ON BODY FLUID COMPOSITION IN THE CICHLID TELEOST /SAROTHERODON MOSSAMBICUS/ ACCLIMATED TO SEAWATER. Gen. Comp. Endocrinol. 38 (1): 38-42. May 1979. SFA 24(4)
[Dep. Zool., Univ. Calif., Berkeley 94720]

79-002693 Mahajan, C. L.; Dheer, J. S. CELL TYPES IN THE PERIPHERAL BLOOD OF AN AIR-BREATHING FISH /CHANNA PUNCTATUS/. J. Fish Biol. 14 (5): 481-487. May 1979. SFA 24(4)
[Dep. Zool., Univ. Rajasthan, Jaipur, India] Different cell types found in the peripheral blood of /Channa punctatus/, an air-breathing freshwater fish have been characterized and identified using morphological, morphometric, cytochemical and autoradiographic techniques. Some of the cytochemical methods used, particularly that of differential staining of haemoglobin have been developed and used for the first time in fishes.

79-002694 Matthews, W. J.; Styron, J. T., Jr. COMPARATIVE TOLERANCE OF HEADWATER AND MAINSTREAM FISHES FOR ABRUPT CHANGE IN PH, DISSOLVED OXYGEN, AND TEMPERATURE. Va. J. Sci. 29 (2): 65. 1978. Abstract only. SFA 24(4)
[Dep. Biol., Roanoke Coll., Salem, VA 24153] The tolerance of a headwater cyprinid (/Phoxinus oreas/) is compared to that of three mainstream cyprinids (/Notropis ardens/, /Notropis albeolus/, and /Notropis cerasinus/) for abrupt changes in pH, dissolved oxygen, and temperature. /P. oreas/ was most tolerant of changes in all three factors, supporting the hypothesis that species of intermittent headwaters are hardier than those of environmentally stable mainstreams. /P. oreas/ survived thermal shocks of + or - 14 C, suffered no mortality in oxygen concentrations of 1.0-1.4 ppm, and survived up to 220 min. at a pH of 3.9. /N. cerasinus/ was slightly more tolerant of the tested factors than /N. ardens/ or /N. albeolus/, and, of those three species, it occurred farthest upstream in a small creek. Even minor differences in environmental tolerance may thus relate to wider distribution of a species.

79-002695 Meyer, R. L. RETINOTECTAL PROJECTION IN GOLDFISH TO AN INAPPROPRIATE REGION WITH A REVERSAL IN POLARITY. Science 205 (4408): 819-821. 24 Aug. 1979. SFA 24(4)
[Div. Biol., Calif. Inst. Technol., Pasadena 91125]

79-002696 Murata, H. [STUDIES ON METABOLISM OF FATTY ACID IN FISH--V. BETA-OXIDATION OF 22:6 ACID IN FISH LIVER AND DARK MUSCLE MITOCHONDRIA.] Bull. Jpn. Soc. Sci. Fish. 45 (3): 379-383. Mar. 1979. In Japanese with English summ. SFA 24(4)
[Lab. Fish. Environ., Fac. Agric., Miyazaki Univ., Miyazaki 880, Japan]

79-002697 Murata, H. [STUDIES ON THE METABOLISM OF FATTY ACID IN FISH--VI. PRODUCTS FORMED BY BETA-OXIDATION OF 16:0 ACID IN CARP HEPATOPANCREAS AND DARK MUSCLE MITOCHONDRIA.] Bull. Jpn. Soc. Sci. Fish. 45 (5): 585-590. May 1979. In Japanese with English summ. SFA 24(4)
[Lab. Fish. Environ., Fac. Agric., Miyazaki Univ., Miyazaki 880, Japan]

79-002698 Murata, H.; Shiraishi, M. [STUDIES ON THE METABOLISM OF FATTY ACID IN FISH--VII. EFFECT OF STARVATION ON BETA-OXIDATION IN CARP HEPATOPANCREAS AND DARK MUSCLE MITOCHONDRIA.] Bull. Jpn. Soc. Sci. Fish. 45 (6): 781-784. June 1979. In Japanese with English summ. SFA 24(4)
[Lab. Fish. Environ., Fac. Agric., Miyazaki Univ., Miyazaku 880, Japan]

79-002699 Nagai, A.; Hisamatsu, S. [ON THE IDENTIFICATION OF THE JAPANESE, EUROPEAN AND AMERICAN EEL BY ELECTROPHORETIC PATTERNS OF ISOENZYMES.] J. Fac. Mar. Sci. Technol. Tokai Univ. No. 12. p. 109-117. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Japan] Comparative studies of tissue specificity have shown that, although lactate dehydrogenase and malate dehydrogenase isoenzyme patterns detected from various tissues of eel have close similarities, it is possible to detect small and specific differences in several tissues. All these electrophoretic studies have shown that Japanese eels are easily distinguished from the other two species of eels by the analysis of the isoenzyme patterns of lactate dehydrogenase and malate dehydrogenase.--From abstr.

79-002700 Nagai, A.; Sugai, N. [IMMUNO-ELECTROPHORETIC ANALYSIS ON PLASMA PROTEIN OF JAPANESE EEL, /ANGUILLA JAPONICA/.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 6: 61-68. 1977[1978]. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka, Japan]

79-002701 Nagata, S.; Matsuno, T. THE OCCURRENCE OF IDOXANTHIN IN FANCY RED CARP /CYPRINUS CARPIO/. Bull. Jpn. Soc. Sci. Fish. 45 (4): 537. Apr. 1979. SFA 24(4)
[Kyoto Coll. Pharm., Yamashina, Kyoto 607, Japan]

79-002702 Neville, C. M. VENTILATORY RESPONSE OF RAINBOW TROUT (/SALMO GAIRDNERI/) TO INCREASED H ION CONCENTRATION IN BLOOD AND WATER. Comp. Biochem. Physiol. A Comp. Physiol. 63 (3): 373-376. 1979. SFA 24(4)
[Dep. Zool., Univ. Toronto, Toronto, ON M5S 1A1, Canada] Ventilation amplitude and rate, inspired P(Co(2)), and arterial pH were measured in rainbow trout exposed to environmental acidification (pH 4.0) in hard and soft water to show the short term (45 min) and long term (5 day) ventilatory response to acidification with and without transient hypercapnia. Unless accompanied by transient hypercapnia there were no short term changes in ventilation or arterial pH, and no long term changes in ventilation despite increasing acidaemia. The results show that without hypercapnia, and whilst oxygen transport is adequate, there is no ventilatory response to increased internal or external H^+ ion Concentration.

79-002703 Nimmo, I. A.; Clapp, J. B.; Strange, R. C. A COMPARISON OF THE GLUTATHIONE S-TRANSFERASES OF TROUT AND RAT LIVER. Comp. Biochem. Physiol. B Comp. Biochem. 63 (3): 423-427. 1979. SFA 24(4)
[Dep. Biochem., Univ. Edinburgh Med. Sch., Teviot Pl., Edinburgh EH8 9AG, Scotland]

79-002704 Nishimura, H.; Lunde, L. G.; Zucker, A. RENIN RESPONSE TO HEMORRHAGE AND HYPOTENSION IN THE AGLOMERULAR TOADFISH /OPSANUS TAU/. Am. J. Physiol. 237 (2): H105-H111. aug. 1979. SFA 24(4)
[Dep. Physiol. Biophys., Univ. Tenn. Cent. Health Stud., Memphis 38163]

79-002705 Nonnotte, G.; Nonnotte, L.; Kirsch, R. CHLORIDE CELLS AND CHLORIDE EXCHANGE IN THE SKIN OF A SEA-WATER TELEOST, THE SHANNY (/BLENNIUS PHOLIS/ L.). Cell Tissue Res. 199 (3): 387-396. 17 July 1979. SFA 24(4)
[Lab. Physiol. Comp. Reg., C.N.R.S., Strasbourg, France]

79-002706 Ohzu, E.; Kasuya, H. STUDIES OF THE HATCHING ENZYME OF THE FISH. I. ISOLATION OF THE HATCHING ENZYME OF THE RAINBOW TROUT, /SALMO GAIRDNERI/. Annot. Zool. Jpn. 52 (2): 125-132. June 1979. SFA 24(4)
[Biol. Inst., Fac. Sci., Univ. Yamagata, Yamagata 990, Japan]

79-002707 Ojha, J.; Mishra, N.; Saha, M. P.; Munshi, J. S. D. BIMODAL OXYGEN UPTAKE IN JUVENILES AND ADULTS AMPHIBIOUS FISH, /CHANNA (= OPHIOCEPHALUS) MARULIUS/. Hydrobiologia 63 (2): 153-159. 2 Apr. 1979. SFA 24(4)
[Post-Grad. Dep. Zool., Bhagalpur Univ., Bhagalpur-812007 (Bihar), India] Oxygen uptake of /Channa marulius/ was studied under water with and without access to air. There was a significant increase in the oxygen uptake through the gills when access to air was prevented. However, this value (0.863 ± 0.058 mlO(2)/indiv./h) was quite low in comparison to the total bimodal oxygen uptake (2.04 ± 0.14 mlO(2) /indiv./h) in juveniles. In adult fish the oxygen uptake per unit time increased appreciably (4.673 ± 0.404 mlO(2)/indiv./h). In juveniles as well as in adults the air breathing dominated over aquatic breathing. This fish showed a definite circadian rhythm in the bimodal oxygen uptake during different hours of the day.

79-002708 Okada, H.; Matumoto, H.; Yamazaki, F. FUNCTIONAL MASCULINIZATION OF GENETIC FEMALES IN RAINBOW TROUT. Bull. Jpn. Soc. Sci. Fish. 45 (4): 413-419. Apr. 1979. SFA 24(4)
[Hokkaido Fish Hatchery, 062 Japan]

79-002709 Olivereau, M.; Olivereau, J. EFFECT OF ESTRADIOL-17 BETA ON THE CYTOLOGY OF THE LIVER, GONADS AND PITUITARY, AND ON PLASMA ELECTROLYTES IN THE FEMALE FRESHWATER EEL. Cell Tissue Res. 199 (3): 431-454. 17 July 1979. SFA 24(4)
[Lab. Physiol., Inst. Oceanogr., 195, rue Saint-Jacques, F-75005 Paris, France]

79-002710 Pasanen, S.; Viljanen, M.; Pulkkinen, E. STRESS CAUSED BY THE 'MARK-RECAPTURE' METHOD TO /COREGONUS ALBULA/ (L). J. Fish Biol. 14 (6): 597-605. June 1979. SFA 24(4)
[Dep. Biol., Univ. Joensuu, Box 111, 80101 Joensuu 10, Finland] The aim of this study was to establish if capture and marking caused stress to /C. albula/, and if a 'mark-recapture' method was suitable for the estimation of a population of /C. albula/. The blood lactate and glucose levels and the liver and muscle glycogen content were determined during the initial handling and subsequent recovery of the fish in the autumn and spring. The blood lactate content did not increase to the critical level. Usually the values were distinctly

79-002710 CONTINUED
less than 100 mg percent, but the blood glucose content increased throughout the whole experiment (24 h) until it reached 250 mg percent. The glycogen content in liver and muscle decreased. The liver glycogen of female /C. albula/ was below 0.3 percent in autumn, while the values for males were 3-5 percent. In spring, the corresponding values were about 0.5 in both sexes. During handling, the critical period was when the glycogen reserves in the liver became negligible, and female /C. albula/ in autumn had the greatest risk of dying because of their low liver glycogen content. Spring seemed to be a better season for marking than the autumn. A steady increase in blood glucose indicated there was also stress in spring and the marking time in both seasons should be less than two hours.

79-002711 Pavlov, D. A. [COMPARATIVE ANALYSIS OF EMBRYONAL-LARVAL DEVELOPMENT OF THE EUROPEAN SALMONS OF THE GENUS /SALMO/.] Zool. Zh. 58 (5): 674-684. May 1979. In Russian with English summ. SFA 24(4)
[State Univ. Moscow, USSR]

79-002712 Peyraud-Waitzenegger, M.; Savina, A.; Laparra, J.; Morfin, R. BLOOD-BRAIN BARRIER FOR EPINEPHRINE IN THE EEL (/ANGUILLA ANGUILLA/ L.). Comp. Biochem. Physiol. C Comp. Pharmacol. 63 (1): 35-38. 1979. SFA 24(4)
[Lab. Physiol. Poisson, ERA CNRS 07 0622, Fac. Sci., 29283-Brest Cedex, France]

79-002713 Precht, H.; Plett, A. THE INFLUENCE OF ENVIRONMENTAL TEMPERATURE AND SALINITY ON ANIMALS. III. SALINITY. Zool. Anz. 202 (5/6): 425-436. 1979. SFA 24(4)
[Zool. Inst., Univ. Kiel, West Germany]

79-002714 Ross, L. G. THE PERMEABILITY TO OXYGEN AND THE GUANINE CONTENT OF THE SWIMBLADDER OF A PHYSOCLIST FISH, /POLLACHIUS VIRENS/. J. Mar. Biol. Assoc. U.K. 59 (2): 437-441. May 1979. SFA 24(4)
[Dep. Biol., Univ. Stirling, Stirling, Scotland] The permeability to oxygen of the intact swimbladder wall and its component layers were examined in a gadoid /Pollachius virens/ (L.). The purine content of the component layers was also measured. Low permeability to oxygen was correlated with a high purine content. The layer responsible for gas retention was the submucosa of the tunica interna. The implications of these results are discussed in terms of control of gas loss from the swimbladder.

79-002715 Sakaguchi, H.; Hamaguchi, A. [PHYSIOLOGICAL STUDIES ON CULTURED RED SEA BREAM--I. SEASONAL VARIATION OF CHEMICAL CONSTITUENTS IN PLASMA, HEPATOPANCREAS AND OTHER VISCERA.] Bull. Jpn. Soc. Sci. Fish. 45 (4): 443-448. Apr. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Fish., Nagasaki Univ., Nagasaki 852, Japan]

79-002716 Sanders, M. J. ^{86}RUBIDIUM AS A POTASSIUM TRACER IN STUDIES ON POTASSIUM REGULATION IN SEA WATER ADAPTED RAINBOW TROUT (/SALMO GAIRDNERI/) AND THE SCULPIN (/LEPTOCOTTUS ARMATUS/). Ph.D. dissertation, Wash. State Univ. 91p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(1):106. July 1979. SFA 24(4)

79-002717 Shackley, S. E.; King, P. E. AMINO ACID INCORPORATION BY ISOLATED OOCYTES OF THE MARINE TELEOST /BLENNIUS PHOLIS/ L. J. Fish Biol. 14 (5): 475-480. May 1979. SFA 24(4)
[Zool. Dep., Univ. Swansea, Swansea, Wales] The uptake of a labelled amino acid, tritiated leucine, by isolated oocytes of /Blennius pholis/ L. is described. Uptake related to protein and RNA synthesis is distinguished by the use of two metabolic inhibitors. An endogenous contribution to the protein yolk is indicated but this may undergo tunrover with time.

79-002718 Sheldon, J. A. THE EFFECTS OF CROWDING ON SERUM CORTICOSTEROIDS IN THE BLUE GOURAMI, /TRICHOGASTER TRICHOPTERUS/ (PALLAS). Ph.D. dissertation, N.Y. Univ. 81p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(12, part 1):5796. June 1979. SFA 24(4)

79-002719 Singh, S. B.; Chanchal, A. K.; Pandey, B. N. STUDIES ON BLOOD DURING DIFFERENT RESPIRATORY CONDITIONS IN /ANABAS TESTUDINEUS/ (BLOCH). Zool. Anz. 202 (5/6): 444-448. 1979. SFA 24(4)
[Dep. Zool., Gaya Coll., Gaya, Bihar, India]

79-002720 Smith, P. J.; Crossland, J. PRESERVATION OF TELEOST PROTEINS BY 2-PHENOXYETHANOL. N.Z. Mar. Freshwater Res. 12 (4): 341-342. Dec. 1978. SFA 24(4)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19062, Wellington, New Zealand]

79-002721 Squires, E. J.; Hall, D. E.; Feltham, L. A. W. SEASONAL CHANGES IN PLASMA AMINO ACID LEVELS IN THE WINTER FLOUNDER (/PSEUDOPLEURONECTES AMERICANUS/). Can. J. Zool. 57 (7): 1438-1442. July 1979. In English with French summ. SFA 24(4)
[Dep. Biochem., Memorial Univ. Newfoundland, St. John's, NF A1B 3X9, Canada]

79-002722 Stoff, J. S.; Rosa, R.; Hallac, R.; Silva, P.; Epstein, F. H. HORMONAL REGULATION OF ACTIVE CHLORIDE TRANSPORT IN THE DOGFISH RECTAL GLAND. Am. J. Physiol. 237 (2): F138-F144. Aug. 1979. SFA 24(4)
[Dep. Med., Harvard Med. Sch., Boston, MA 02215]

79-002723 Suzuki, K. [PROTOGYNOUS SEX REVERSALS IN SERRANID FISHES.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 6: 79-84. 1977[1978]. In Japanese with English summ. SFA 24(4)
[Mar. Sci. Mus., Tokai Univ., Miho, Shimizu, Shizuoka-ken, Japan]

79-002724 Suzuki, T.; Suyama, M. [PROPERTIES OF PHOSPHOPEPTIDES IN THE EXTRACT OF RAINBOW TROUT EGGS.] Bull. Jpn. Soc. Sci. Fish. 45 (3): 385-388. Mar. 1979. In Japanese with English summ. SFA 24(4)
[Tokyo Univ. Fish., Konan-4, Minato-ku,`Tokyo 108, Japan]

79-002725 Takada, K.; Kamiya, H.; Hashimoto, Y. STUDIES ON LIPIDS OF SOME STROMATEIDEI FISHES. Bull. Jpn. Soc. Sci. Fish. 45 (5): 605-610. May 1979. SFA 24(4)
[Cent. Res. Lab. Kantoishi Pharm. Co., Tokorozawa, Saitama Pref. 359, Japan]

79-002726 Takahashi, K.; Ito, K.; Sato, R. GLYCONEOGENESIS IN CHUM SALMON ALEVIN. Tohoku J. Agric. Res. 29 (3-4): 146-158. Dec. 1978. SFA 24(4)
[Dep. Fish. Sci., Tohoku Univ., Sendai, Japan]

79-002727 Takeda, T.; Itazawa, Y. AN ESTIMATION OF THE MINIMUM LEVEL OF DISSOLVED OXYGEN IN WATER REQUIRED FOR NORMAL LIFE OF FISH--III. AN EXPERIMENT WITH CARP AVOIDING CARBON DIOXIDE ACCUMULATION. Bull. Jpn. Soc. Sci. Fish. 45 (3): 329-333. Mar. 1979. SFA 24(4)
[Dep. Fish., Fac. Agric., Kyushu Univ., 46-04 Hakozaki, Higashi-ku, Fukuoka 812, Japan] Low P(CO(2)) in the ambient water owing to diffusion of expired carbon dioxide into nitrogen bubbles, in the present experiments, reduced P(CO(2)), in the arterial blood, increased oxygen affinity of the blood, and caused lowering from 70-80 mmHg to 30 mmHg of the minimum level of ambient oxygen required for maintenance of oxygen concentration in the arterial blood. The higher value obtained by the previous experiments, where accumulation of carbon dioxide in both water and blood was not avoided, is considered to be reliable as the criterion of ambient oxygen, because decrease of ambient oxygen is usually followed by increase of ambient carbon dioxide at an equal ratio. The present value is considered to be useful for discussion in basic physiology of carp respiration, because the effects of hypoxia on fish are clearly shown by avoiding the effects of carbon dioxide accumulation.

79-002728 Terao, T. [NUTRITIONAL CONSTITUENTS IN MUSCLE AND BIOCHEMICAL COMPONENTS IN BLOOD OF CARP, /CYPRINUS CARPIO/, IN WINTER SEASON.] Sci. Rep. Hokkaido Fish Hatchery 33: 21-26. Dec. 1978. In Japanese with English summ. SFA 24(4)
[Hokkaido Fish Hatchery, Hokkaido, Japan]

79-002729 Teyssier, M.; Garin, D.; Peres, G. LES MODIFICATIONS DES CELLULES NEUROSECRETOIRES DU NOYAU PREOPTIQUE DE LA TANCHE (/TINCA TINCA/) ET DE DIFFERENTS IONS PLASMATIQUES CONSECUTIVES A UNE ELEVATION DE LA TEMPERATURE DE L'EAU. [MODIFICATIONS OF NEUROSECRETORY CELLS IN PREOPTIC NUCLEUS OF TENCH (/TINCA TINCA/) AND SOME PLASMATIC IONS, ACCORDING TO TEMPERATURE INCREASE OF WATER.] C. R. Seances Soc. Biol. Fil. 172 (5): 934-938. 1978. In French with English summ. SFA 24(4)
[Lab. Physiol. Gen. Comp., Univ. Claude Bernard Lyon I, 43 Bd der 11 Novembre 1918, 69621 Villeurbanne, France]

79-002730 Totland, G. K.; Kryvi, H. LACTATE DEHYDROGENASE IN THE SWIMMING MUSCLES OF THE CARTILAGINOUS FISH /CHIMAERA MONSTROSA/. Acta Zool. (Stockh.) 60 (1): 43-45. 1979. SFA 24(4)
[Inst. Anat., Univ. Bergen, Norway]

79-002731 Truscott, B. STEROID METABOLISM IN FISH. IDENTIFICATION OF STEROID MOIETIES OF HYDROLYZABLE CONJUGATES OF CORTISCL IN THE BILE OF TROUT /SALMO GAIRDNERII/. Gen. Comp. Endocrinol. 38 (2): 196-206. June 1979. SFA 24(4)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

79-002732 Uematsu, K.; Hanyu, I.; Hibiya, T.; Yamamori, K. EMG RECORDING FROM THE SPAWNING SALMON. Bull. Jpn. Soc. Sci. Fish. 45 (3): 409. Mar. 1979. SFA 24(4)
[Dep. Fish., Fac. Fish. Anim. Husb., Hiroshima Univ., Hiroshima 720, Japan] The result reported here suggests that, at least in salmon and trout, extrusion of the eggs from the body cavity is resulted from a long continued, convulsive contraction of almost all the trunk muscles.--From text.

79-002733 Ugajin, M. [STUDIES ON THE TAXONOMY OF MAJOR MICROFLORA ON THE INTESTINAL CONTENTS OF SALMONIDS.] Bull. Jpn. Soc. Sci. Fish. 45 (6): 721-731. June 1979. In Japanese with English summ. SFA 24(4)
[Nakagawa Br. Tochigi Pref. Fish. Exp. Stn., Ogawa-machi, Nasu Dist. 432-3, Japan]

79-002734 Wada, S.; Koizumi, C.; Takiguchi, A.; Nonaka, J. TRIGLYCERIDE COMPOSITION OF BLACK COD LIPID--I. TRIGLYCERIDE COMPOSITION BASED ON THE ACYL CARBON NUMBER AND DEGREE OF UNSATURATION. Bull. Jpn. Soc. Sci. Fish. 45 (5): 611-614. May 1979. SFA 24(4)
[Dep. Food Sci. Technol., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo 108, Japan]

79-002735 Wada, S.; Koizumi, C.; Takuguchi, A.; Nonaka, J. TRIGLYCERIDE COMPOSITION OF BLACK COD LIPID--II. POSSIBLE FATTY ACID COMBINATIONS IN TRIGLYCERIDES AND THEIR CONTENTS. Bull. Jpn. Soc. Sci. Fish. 45 (5): 615-622. May 1979. SFA 24(4)
[Dep. Food Sci. Technol., Tokyo Univ. Fish., Konan 4, Minato-ku, Tokyo 108, Japan]

79-002736 Wakeman, J. M.; Wohlschlag, D. E. SALINITY STRESS AND SWIMMING PERFORMANCE OF SPOTTED SEATROUT. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 357-361. 1977[1979]. SFA 24(4)
[Univ. Tex. Mar. Sci. Inst., Port Aransas Mar. Lab., Port Aransas 78373] Specific swimming speeds (L sec^{-1}) of spotted seatrout (/Cynoscion nebulosus/) were linearly related ($S = -0.16 + 0.93X$) to tail-beats/sec (x) over speeds ranging from about 1.5-4.0 length/sec. Maximum sustained swimming speeds were measured at salinities ranging from 10 to 45 ppt in intervals of 5 ppt. At about 20 to 25 ppt, maximum sustained swimming speeds were close to 4 lengths/sec, but performance was reduced at salinities above or below this range. At 45 ppt, maximum sustained speeds were only about 2 lengths/sec. These results indicate that maximum sustained swimming performance can provide an effective method for evaluating salinity stresses.

79-002737 Wallace, R. A.; Selman, K. PHYSIOLOGICAL ASPECTS OF OOGENESIS IN TWO SPECIES OF STICKLEBACKS, /GASTEROSTEUS ACULEATUS/ L. AND /APELTES QUADRACUS/ (MITCHILL). J. Fish Biol. 14 (6): 551-564. June 1979. SFA 24(4)
[Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

79-002738 Wootton, R. J.; Mills, L. A. ANNUAL CYCLE IN FEMALE MINNOWS /PHOXINUS PHOXINUS/ (L.) FROM AN UPLAND WELSH LAKE. J. Fish Biol. 14 (6): 607-618. June 1979. SFA 24(4)
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79-002742 Chevassus, B. HYBRIDIZATION IN SALMONIDS: RESULTS AND PERSPECTIVES. Aquaculture 17 (2): 113-128. June 1979. SFA 24(4)
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This report presents a critical review of interspecific hybridization in salmonids and discusses the potentiality of hybrids for water management and fish farming.

79-002743 Gold, J. R.; Pipkin, R. E.; Gall, G. A. E. NOTES ON A HYBRIDIZATION EXPERIMENT BETWEEN RAINBOW AND GOLDEN TROUT. Calif. Fish Game 65 (3): 179-183. July 1979. SFA 24(4)
[Genet. Sect., Tex. A&M Univ., College Station 77843]

79-002744 Grimm, H. UNTERSUCHUNGEN ZUR EVOLUTION UNTERSCHIEDLICH BESCHUPPTER POPULATIONEN VON /APHANIUS ANATOLIAE/ (LEIDENFROST, 1912) (PISCES, CYPRINODONTIDAE). GENETIK DER EIGROESSE. [INVESTIGATIONS ON THE EVOLUTION OF DIFFERENTLY SCALED POPULATIONS FOUND IN THE SPECIES /APHANIUS ANATOLIAE/ (LEIDENFROST, 1912) (PISCES, CYPRINODONTIDAE). GENETIC OF THE EGG-SIZE.] Z. Zool. Syst. Evolutionsforsch. 17 (1): 66-78. Mar. 1979. In German with English and French summ. SFA 24(4)

79-002745 Gross, H. P. GEOGRAPHIC VARIATION IN EUROPEAN NINESPINE STICKLEBACKS, /PUNGITIUS PUNGITIUS/. Copeia 1979 (3): 405-412. 1 Aug. 1979. SFA 24(4)
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79-002747 Kerby, J. H. MERISTIC CHARACTERS OF TWO /MORONE/ HYBRIDS. Copeia 1979 (3): 513-518. 1 Aug. 1979. SFA 24(4)
[N.C. Coop. Fish. Res. Unit, N.C. State Univ., Raleigh 27650]

79-002748 Kijima, A.; Fujio, Y. [GEOGRAPHICAL DISTRIBUTION OF IDH AND LDH ISOZYMES IN CHUM SALMON POPULATION.] Bull. Jpn. Soc. Sci. Fish. 45 (3): 287-295. Mar. 1979. In Japanese with English summ. SFA 24(4)
[Dep. Fish. Sci., Fac. Agric., Tohoku Univ., Sendai 980, Japan]

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[Dep. Biol., Jpn. Women's Univ., 2-8-1 Mejirodai, Bunkyo-ku, Tokyo, Japan]

79-002750 Loudenslager, E. J.; Thorgaard, G. H. KARYOTYPIC AND EVOLUTIONARY RELATIONSHIPS OF THE YELLOWSTONE (/SALMO CLARKI BOUVIERI/) AND WEST-SLOPE (/S. C. LEWISI/) CUTTHROAT TROUT. J. Fish. Res. Board Can. 36 (6): 630-635. June 1979. In English with French summ. SFA 24(4)
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79-002751 Lynch, J. C.; Vyse, E. R. GENETIC VARIABILITY AND DIVERGENCE IN GRAYLING, /THYMALLUS ARCTICUS/. Genetics 92 (1): 263-278. May 1979. SFA 24(4)
[Dep. Biol., Mont. State Univ., Bozeman 59717] In North America there are two disjunct forms of grayling, Montana and arctic, which have been separated for approximately 75,000 to 100,000 years. Electrophoretic analysis of thirty-six protein loci in these forms has revealed: (1) levels of gene duplication comparable to other salmonids, (2) a level of heterozygosity similar to other salmonids, (3) a fast and a slow evolving set of proteins, and (4) no obvious relationship between genetic variability and enzyme function. The genetic divergence between these populations may warrant subspecific designations for these two forms.

79-002752 Mauro, M. L.; Micheli, G. DNA REASSOCIATION KINETICS IN DIPLOID AND PHYLOGENTICALLY TETRAPLCID CYPRINIDAE. J. Exp. Zool. 208 (3): 407-416. June 1979. SFA 24(4)
[Cent. Stud. Acidi Nucleici, C.N.R., Inst. Fisiol. Gen., Univ. Rome, Citta Univ., Rome, 00185 Italy]

79-002753 Murofushi, M.; Yosida, T. H. CYTOGENETICAL STUDIES ON FISHES, I. KARYOTYPES OF FOUR FILEFISHES. Jpn. J. Genet. 54 (3): 191-195. June 1979. SFA 24(4)
[Lab. Biol., Fac. Mishima Junior Coll., Nikcn Univ., Mishima 411, Japan]

79-002754 Neff, N. A.; Smith, G. R. MULTIVARIATE ANALYSIS OF HYBRID FISHES. Syst. Zool. 28 (2): 176-196. June 1979. SFA 24(4)
[Dep. Vert. Paleontol., Am. Mus. Nat. Hist., New York, NY 10024]

79-002755 Nickerson, R. B. SEPARATION OF SOME PINK SALMON (/ONCORHYNCHUS GORBUSCHA/ WALBAUM) SUB-POPULATIONS IN PRINCE WILLIAM SOUND, ALASKA BY LENGTH-WEIGHT RELATIONSHIPS AND HORIZONTAL STARCH GEL ELECTROPHORESIS. Alaska Dep. Fish Game Inf. Leafl. No. 181. 36p. May 1979. SFA 24(4)
[Alaska Dep. Fish Game, Cordova] The generation of a comprehensive salmon hatchery program (public and private) in Alaska necessitates implementation of certain controls to maintain genetic integrity of local indigenous stocks. Controls achieved by identification and classification of potential hatchery donor stock, environmental matching through categorization of stream-types, and coordination with an appropriate genetic policy are deemed essential. Prince William Sound pink salmon stocks (/Oncorhynchus gorbuscha/ Walbaum) (within and among systems) were separated to some extent by length-weight criteria, however, greater refinement of separations was accomplished with starch gel electrophoresis. Thirty-seven sub-populations of even-year pink salmon were reduced, by Roger's coefficient of genetic similarity, to seven stock types. Several protein variants were observed in this study which had never previously been observed in pink salmon.

79-002756 Ryabov, I. C. MORPHOLOGICAL CHARACTERISTICS OF THE FRY OF A CARP X ROSY BARB /CYPRINUS CARPIO/ L. X /PUNTIUS CONCHCNIUS/ (HAM. ET BUCH.) HYBRID. Moscow Univ. Biol. Sci. Bull. 33 (2): 44-47. 1978. SFA 24(4)
[Biol. Dep., Moscow Univ., USSR]

79-002757 Ryman, N.; Allendorf, F. W.; Stahl, G. REPRODUCTIVE ISOLATION WITH LITTLE GENETIC DIVERGENCE IN SYMPATRIC POPULATIONS OF BROWN TROUT (/SALMO TRUTTA/). Genetics 92 (1): 247-262. May 1979. SFA 24(4)
[Dep. Genet., Univ. Stcckholm, Box 6801, S-113 86 Stockholm, Sweden]

79-002758 Slyn'ko, V. I.; Semenova, S. K. ESTERASE AS A SEX-LINKED CHARACTERISTIC IN SALMON. Dokl. Biol. Sci. (Engl. Transl. Dokl. Akad. Nauk SSSR Ser. Biol.) 243 (1-6): 555-556. Nov.-Dec. 1978. SFA 24(4)
[Inst. Gen. Genet., Acad. Sci. USSR, Moscow, USSR]

79-002759 Smith, P. J.; Francis, R. I. C. C.; Paul, L. J. GENETIC VARIATION AND POPULATION STRUCTURE IN THE NEW ZEALAND SNAPPER. N.Z. Mar. Freshwater Res. 12 (4): 343-350. Dec. 1978. SFA 24(4)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19062, Wellington, New Zealand]

79-002760 Stauffer, J. R., Jr.; Hocutt, C. H.; Denoncourt, R. F. STATUS AND DISTRIBUTION OF THE HYBRID /NOCOMIS MICROPOGON/ X /RHINICHTHYS CATARACTAE/, WITH A DISCUSSION OF HYBRIDIZATION AS A VIABLE MODE OF VERTEBRATE SPECIATION. Am. Midl. Nat. 101 (2): 355-365. Apr. 1979. SFA 24(4)
[Appalachian Environ. Lab., Univ. Md., Frostburg 21532] The hybrid /Nocomis micropogon/ x /Rhinichthys cataractae/ has been know to occur in the upper Monongahela River system from 1899 to present. A comparison of the hybrid with its putative parents in 16 morphometric and meristic characteristics by a hybrid index indicates it is intermediate in six characters, closer to /R. cataractae/ in three, and closer to /N. micropogon/ in two; five characters are extreme or outside the range of the means of the parents. /Nocomis micropogon/ x /R. cataractae/ is unquestionably of hybrid origin; however, it fulfills the characteristics of a morphological species: a definite homogeneous range, clear consistency of characters and success in nature. Hybridization as a mode of speciation in fishes is discussed.

79-002761 Suzuki, R. [CROSS-BREEDING EXPERIMENTS ON THE SALMONID FISH IN JAPAN.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 5: 175-188. 1976[1977]. In Japanese with English summ. SFA 24(4)
[Freshwater Fish. Res. Lab., Jpn. Fish. Agency, Ueda, Nagano-ken, Japan]

BEHAVIOR

79-002762 Blake, R. W. THE SWIMMING OF THE MANDARIN FISH /SYNCHROPUS PICTURATUS/ (CALLIONYIIDAE: TELEOSTEI). J. Mar. Biol. Assoc. U.K. 59 (2): 421-428. May 1979. SFA 24(4)
[Dep. Zool., Univ. Cambridge, Downing Street, Cambridge, England] The kinematics and energetics of forward swimming in /Synchropus picturatus/ (Peters), a slow swimming, negatively buoyant (S.G. = 1.12) demersal teleost was studied. The induced power (for one fin) decreased from 4.78×10^3 erg s^{-1} at 0.12 lengths s^{-1} (=0.76 cm s^{-1}) to 2.7×10^3 erg s^{-1} at 3.05 L s^{-1} (= 19.2 cm s^{-1}). The profile power required to overcome the drag on an undulatory fin was calculated for the case of laminar boundary layer (values range from about 1.0×10^2 erg s^{-1} at 0.12 L s^{-1} to about 5.5×10^2 erg s^{-1} at 3.05 L s^{-1}) and a turbulent boundary layer (values range from about 6.0×10^1 erg s^{-1} at 0.12 L s^{-1} to about 2.1×10^2 erg s^{-1} at 3.05 L s^{-1}) over the fins. Values of the power required to overcome the drag on the body (parasite power) were calculated, assuming a laminar boundary layer over the body and ranged from 0.2 erg s^{-1} at 0.12 L s^{-1} to about 4.5×10^2 erg s^{-1} at 3.05 L s^{-1}. Results are discussed in relation to the swimming of other fish and the flight energetics of birds and

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helicopters.

79-002763 Burgess, J. W.; Shaw, E. DEVELOPMENT AND ECOLOGY OF FISH SCHOOLING. Oceanus 22 (2): 11-17. 1979. SFA 24(4)
[Dep. Biol. Sci., Stanford Univ., Palo Alto, CA]

79-002764 Downhower, J. F.; Brown, L. SEASONAL CHANGES IN THE SOCIAL STRUCTURE OF A MOTTLED SCULPIN (/COTTUS BAIRDI/) POPULATION. Anim. Behav. (Bailliere Tindall, Publ.) 27 (2): 451-458. May 1979. SFA 24(4)
[Dep. Zool., Ohio State Univ., Columbus 43210] Adult male mottled sculpins (/Cottus bairdi/) were solitary during the breeding season (April to June) and the following summer. Gravid females were randomly distributed with respect to one another, but were most frequently found with males that had previously mated. In addition, the number of egg masses found at certain sites was far greater than expected on the basis of chance matings. These patterns suggest that females visited several spawning sites before breeding, and that certain sites or males were more attractive than others. Although unsexable individuals were randomly dispersed they were rarely found at sites occupied by adult males. This pattern may reflect the influence of intraspecific predation of larger sculpins on smaller conspecifics.

79-002765 Durand, J. P. PHENOMENES DE CONVERGENCES TISSULAIRES ET CYTOLOGIQUES, LIES AUX PROCESSUS DEGENERATIFS QUI AFFECTENT L'OEIL, CHEZ DEUX TELEOSTEENS CAVERNICOLES /ASTYANAX (ANOPTICHTHYS) MEXICANUS/ (CHARACIDAE) ET /LUCIFUGA (STYGICOLA) DENTATUS/ (OPHIDIIDAE). [PHENOMENA OF TISSULAR AND CYTOLOGICAL CONVERGENCES IN RELATION TO DEGENERATIVE PROCESSES AFFECTING THE EYE IN TWO CAVE TELEOSTS.] Bull. Soc. Zool. Fr. 103 (3): 269-274. 1978. In French with English summ. SFA 24(4)
[Lab. Souterrain Cent. Natl. Rech. Sci., Moulis, 09200 Saint-Girons, France]

79-002766 Fujiya, M.; Sakaguchi, S.; Fukuhara, O. [AUDIO-SIGNAL TRAINING OF RED SEABREAM.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 205-214. 1974[1977]. In Japanese with English summ. SFA 24(4)
[Freshwater Fish. Res. Lab., Hino, Tokyo, Japan]

79-002767 Georgieva, V.; Patzner, R. A.; Adam, H. TRANSMISSIONS- UND RASTERELEKTRONEN- MIKROSKOPISCHE UNTERSUCHUNG AN DEN SINNESKNOSPEN DER TENTAKELN VON /MYXINE GLUTINOSA/ L. (CYCLOSTOMATA). [TRANSMISSION AND SCANNING ELECTRON MICROSCOPICAL STUDY OF THE SENSORY BUDS IN THE BARBELS OF /MYXINE GLUTINOSA/ L. (CYCLOSTOMATA).] Zool. Scr. 8 (1): 61-67. 1979. In German with English summ. SFA 24(4)
[Zool. Inst., Univ. Salzburg, Austria]

79-002768 Glova, G. J. PATTERN AND MECHANISM OF RESOURCE PARTITIONING BETWEEN STREAM POPULATIONS OF JUVENILE COHO SALMON (/ONCORHYNCHUS KISUTCH/) AND COASTAL CUTTHROAT TROUT (/SALMO CLARKI CLARKI/). Ph.D. dissertation, Univ. British Columbia 1978. From Diss. Abstr. Int. B Sci. Eng. 39(12, part 1):5738. June 1979. SFA 24(4)

79-002769 Heland, M. OBERVATIONS SUR L'ESTABLISSEMENT DU COMPORTEMENT DE NAGE FACE AU COURANT CHEZ L'ALEVIN DE TRUITE, /SALMO TRUTTA/ L., EN RUISSEAU ARTIFICIEL. [OBSERVATIONS ON THE ESTABLISHMENT OF SWIMMING BEHAVIOUR AGAINST THE CURRENT IN TROUT ALEVINS, /SALMO TRUTTA/ L., IN AN ARTIFICIAL STREAM.] Ann. Limnol. 14 (3): 273-280. 1978. In French with English summ. SFA 24(4)
[Lab. Ecol. Poissons, I.N.R.A., Cent. Rech. Hydrobiol., B.P. 3, Saint-Pee-sur-Nivelli, 64310 Ascain, France] 500 alevins were introduced into the gravel of an artificial stream. At the start of emergence, the activity of some alevins was recorded daily over 30 minutes. The essential elements of early activity are expressed as a swimming behaviour against the current so that a stable body position is maintained. At the beginning, the static swimming behaviour is shown in brief bursts. Later, these periods of static swimming become longer and less numerous. This static swimming behaviour precedes territorial behaviour.

79-002770 Hettler, W. F. SWIMMING SPEEDS OF JUVENILE ESTUARINE FISH IN A CIRCULAR FLUME. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 392-398. 1977[1979]. SFA 24(4)
[NMFS, Southeast Fish. Cent., Beaufort, NC 28516] Sustained voluntary swimming speeds of 5 species of juvenile estuarine fish were determined in a laboratory circular flume, 2.5 m in mean circumference. Successful tests depended on the fish's ability to avoid downstream displacement through positive rheotaxis. The following swimming speeds, in body lengths (BL/sec) were measured: 3 to 6 cm Atlantic menhaden (/Brevoortia tyrannus/), the species of primary interest, swam 5 (at 13 C) to 11 (at 30 C) BL/sec; striped mullet (/Mugil cephalus/), 3 cm, swam 8 (at 15 C) to 12 (at 25 C) BL/sec; pinfish (/Lagodon rhomboides/), 4 cm, swam 11 BL/sec (27 C); spot (/Leiostomus xanthurus/), 4 cm, swam 6 BL/sec (25 C); Atlantic croaker (/Micropogon undulatus/), 7 cm, swam 5 BL/sec (30 C). An evaluation of the apparatus and implications of the data for predicting impingement of juveniles on power plant intake screens are included.

79-002771 Itzkowitz, M. ON THE ORGANIZATION OF COURTSHIP SEQUENCES IN FISHES. J. Theor. Biol. 78 (1): 21-28. 7 May 1979. SFA 24(4)
[Dep. Zool., Univ. West Indies, Kingston 7, Jamaica] In many of the fish species studied in detail, courtship is organized into short discrete periods of activity (bouts) that are sufficiently independent of each other to allow the pair to react to external stimuli. When isolated in an aquarium, a pair produces long bouts by haphazardly joining sequences of events. The reduction of variation within the sequences of long bouts is accomplished with the utilization of the same introductory pattern ("tonic key signs"). In long courting species, alternative sequences exist throughout courtship but with gradual shifts in the probabilities of some behaviors.

79-002772 Jorgensen, J. M.; Munk, O. PHOTOPHORES AND PRESUMABLY LUMINOUS CHIN BARBEL AND PECTORAL FIN RAY FILAMENTS OF /THYSANACTIS DENTEX/ (PISCES: STOMIATOIDEA). Acta Zool. (Stockh.) 60 (1): 33-42. 1979. SFA 24(4)
[Zool. Inst., Univ. Aarhus, Denmark]

79-002773 Kawamura, G. [FUNDAMENTAL STUDY ON APPLICATION OF THE VISION OF SPOTTED MACKEREL, /PNEUMATOPHORUS TAPEINOCEPHALUS/ (BLEEKER), TO ANGLING TECHNIQUES--I. IMPORTANCE OF VISION ESTIMATED FROM BRAIN PATTERN, VISUAL ACUITY OF RETINA, AND ACCOMMODATION.] Bull. Jpn. Soc. Sci. Fish. 45 (3): 281-286. Mar. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Fish., Kagoshima Univ., Kagoshima, 890 Japan]

79-002774 Kawamura, G. [FUNDAMENTAL STUDY ON APPLICATION OF THE VISION OF SPOTTED MACKEREL, /PNEUMATOPHORUS TAPEINOCEPHLUS/ (BLEEKER), TO ANGLING TECHNIQUES--III. RETINOMOTOR RESPONSE.] Bull. Jpn. Soc. Sci. Fish. 45 (5): 553-555. May 1979. In Japanese with English Summ. SFA 24(4)
[Lab. Fish. Technol., Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

79-002775 Kawamura, G. [FUNDAMENTAL STUDY ON APPLICATION OF THE VISION OF SPOTTED MACKEREL, /PNEUMATOPHORUS TAPEINOCEPHALUS/ (BLEEKER), TO ANGLING TECHNIQUES--II. SPECTRAL SENSITIVITY AND COLOR VISION.] Bull. Jpn. Soc. Sci. Fish. 45 (5): 549-551. May 1979. In Japanese with English summ. SFA 24(4)
[Lab. Fish. Technol., Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

79-002776 Kuroki, T.; Sakamoto, W.; Aoki, I.; Inagaki, T. [ANALYSIS OF SCHOOLING OF FISH.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 6: 47-57. 1977[1978]. In Japanese with English summ. SFA 24(4)
[Tokyo Univ. Fish., Konan, Minato-ku, Tokyo, Japan]

79-002777 Matthews, W. J.; Hill, L. G. AGE-SPECIFIC DIFFERENCES IN THE DISTRIBUTION OF RED SHINERS, /NOTROPIS LUTRENSIS/, OVER PHYSICOCHEMICAL RANGES. Am. Midl. Nat. 101 (2): 366-372. Apr. 1979. SFA 24(4)
[Dep. Zool., Univ. Okla., Norman 73019] Niche breadth and overlap indices were used to compare the distributions of juvenile (less than 24 mm SL) and adult red shiners (/Notropis lutrensis/) in ranges of 10 physicochemical factors at five different times of year at a field study site in central Oklahoma. Compared to adults, juveniles at times selected higher temperatures, higher oxygen concentrations, higher pH, lower total dissolved solids, lower turbidity and more stable substrates. Compared to juveniles, adults at times occupied deeper water and locations with more shelter and more shade. The two age groups did not segregate for current speed, as both selected the slowest speeds available. Overlap between the age groups was greatest during environmental stress. Within ranges of the various factors, adults had a wider habitat breadth 15 of the 20 times that differences in breadth were meaningful. Changes in adult mean habitat breadth were more closely related to environmental change than were changes in juvenile habitat breadth.

79-002778 Maughan, O. E.; Saul, G. E. DISTRIBUTION OF SCULPINS IN THE CLEARWATER RIVER BASIN, IDAHO. Great Basin Nat. 39 (1): 59-62. 31 Mar. 1979. SFA 24(4)
[Okla. Coop. Fish. Res. Unit, Okla. State Univ., Stillwater 74074] The distributions of /Cottus bairdi/, /C. rhotheus/, and /C. beldingi/ exhibited a highly significant positive degree of association. Conversely, the distribution of /C. confusus/ exhibited a highly significant negative association with the distributional complex, /C. bairdi/, /C. rhotheus/, and /C. beldingi/. These species of sculpins can be grouped into two assemblages; one based on the distribution of /C. confusus/ and the other based on the combined distributions of the other three species. The factor or factors limiting the downstream distribution of /C. confusus/ or the upstream distribution of the other three species could not be positively identified. However, we hypothesize that competition between /C. confusus/ and one or more members of the /C. bairdi/, /C. rhotheus/, and /C. beldingi/ complex is involved. In the area of overlapping distributions among /C. bairdi/, /C. rhotheus/, and /C. beldingi/ we hypothesize that resource partitioning is occurring. However, the data did not allow evaluation of this hypothesis.

79-002779 McKaye, K. R.; Weiland, D. J.; Lim, T. M. COMMENTS ON THE BREEDING BIOLOGY OF /GOBIOMORUS DORMITOR/ (OSTEICHTHYES: ELEOTRIDAE) AND THE ADVANTAGE OF SCHOOLING BEHAVIOR TO ITS FRY. Copeia 1979 (3): 542-544. 1 Aug. 1979. SFA 24(4)
[Dep. Biol., Yale Univ., New Haven, CT 06520]

79-002780 Miyazaki, C. [INFLUENCE OF NOISE, LIGHT AND MUD SUSPENSION DUE TO MARINE WORKS AND TRAINS ON THE SCHOOLING BEHAVIOUR OF FISH.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 2: 39-58. 1973[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka-ken, Japan]

79-002781 Moss, R. E.; Cross, F. B. MICROHABITAT SELECTION BY RIFFLE FISHES IN THE NEOSHO RIVER. Trans. Kans. Acad. Sci. 81: 91-92. 1978. Abstract only. SFA 24(4)
[Mus. Nat. Hist., Univ. Kans., Lawrence] Quantitative samples of fishes, benthos, and physical parameters were made in riffle areas of the Neosho River. Canonical correlation in conjunction with Andrews high dimensional plots was used to relate fishes to benthos, fishes to physical parameters, and benthos to physical parameters. Quadrat sampling of fishes indicated strong microhabitat selection in flow regimes and substrate types. Benthic samples also suggested that substrates and current are important in determining microhabitat distribution for most invertebrates. Catfish distributions were related primarily to substrate types and species interactions. Cyprinid habitat selection was strongly influenced by current velocities and related physical parameters, as were sucker distributions. Darter microhabitats were not easily defined for most species, but substrate type seemed important. Laboratory stream aquaria were used to observe substrate preferences and current orientation, supplementing field data. Additionally, field tests were conducted to determine the predictive accuracy of several simple statistical models of fish distribution in Neosho River riffles.

79-002782 Peterson, R. H.; Metcalfe, J. I. RESPONSES OF ATLANTIC SALMON ALEVINS TO TEMPERATURE GRADIENTS. Can. J. Zool. 57 (7): 1424-1430. July 1979. In English with French summ. SFA 24(4)
[Fish. Oceans Can., Biol. Stn., St. Andrews, NB E0G 2X0, Canada] Newly hatched Atlantic salmon (/Salmo salar/) alevins aggregated in the lowest temperature available in a temperature gradient, possibly because of lower levels of locomotor activity at lower temperatures. At approximately 250 degree-days after hatching, alevins demonstrated a temperature selection capability and no longer aggregated in the lowest temperature. Possible mechanisms underlying the observed distributional change in a temperature gradient are discussed.

79-002783 Raynauld, J.-P.; Laviolette, J. R.; Wagner, H.-J. GOLDFISH RETINA: A CORRELATE BETWEEN CONE ACTIVITY AND MORPHOLOGY OF THE HORIZONTAL CELL IN CONE PEDICULES. Science 204 (4400): 1436-1438. 29 June 1979. SFA 24(4)
[Cent. Rech. Sci. Neurol., Fac. Med., Univ. Montreal, PQ H3C 3J7, Canada]

79-002784 Ribbink, A. J.; Hill, B. J. DEPTH EQUILIBRATION BY TWO PREDATORY CICHLID FISH FROM LAKE MALAWI. J. Fish Biol. 14 (6): 507-510. June 1979. SFA 24(4)
[Fish. Res. Cent., P.O. Box 27, Monkey Bay, Malawi] The cichlid fish, /Haplochromis polystigma/ and /Haplochromis livingstonii/ are piscivorous ambush predators endemic to Lake Malawi, Africa. Experimentally it was found that large adult /H. livingstonii/ could equilibrate to 38 m, but that juveniles were restricted to shallower depths. Mean depth attained by 8 /H. polystigma/ was 45 m but two individuals exceeded the maximum simulated depth (59 m). /H. livingstonii/ had a mean equilibration rate of 4.7 m day^{-1} for the first 10 m declining to 2.4 m day^{-1} thereafter. The mean rate of descent for /H. polystigma/ was 3.8 m day^{-1} for the first 10 m and 2.8 m day^{-1} thereafter. The fish were decompressed at a rate of 20 percent decrease every 12 h. Although cichlid fishes occur down to 200 m depth in Lake Malawi, experimental and field data indicate that the depth distribution of individual species is restricted and that the restriction is largely related to swimbladder physiology. All cichlid species so far tested equilibrate slowly to depth (2 to 5 m a day) and are not capable of rapid decompression.

79-002785 Schoenherr, A. A. NICHE SEPARATION WITHIN A POPULATION OF FRESHWATER FISHES IN AN IRRIGATION DRAIN NEAR THE SALTON SEA, CALIFORNIA. Bull. South. Calif. Acad. Sci. 78 (1): 46-55. Apr. 1979. SFA 24(4)
[Div. Life Sci., Fullerton Coll., Fullerton, CA 92634] The fish fauna of the King Street canal is a mixture of native and introduced species. Inflow from a thermal well at 42°C and irrigation runoff at 22°C were responsible for a thermal gradient that, in addition to differences in flow, held fishes in remarkably pure species populations. On 19 March 1977, /Cyprinodon macularius/ was found most abundantly in water 10 cm deep at 39°C. /Gambusia affinis/ occurred in flowing water 25 cm deep at 32°C. Only /Poecilia sphenops/ inhabited a cool water outflow 18 cm deep at 22°C. Downflow, /Poecilia latipinna/ was taken most commonly in slow moving water up to 50 cm deep at 26°C, and /Notropis lutrensis/ occurred in riffles up to 25 cm deep at similar temperatures. Flooding during late summer 1977 and subsequent reconstruction of the canal obliterated most of the habitat diversity. All five species survived, albeit seriously reduced in number, and the species sorting that was previously observed also was no longer in evidence. Thermal differences remained, and a pond was constructed

79-002785 CONTINUED
that impounded hot water. Later, on 17 July 1978, the pond included /Cyprinodon macularius/, /Gambusia affinis/, /Poecilia latipinna/ and a new introduction, /Tilapia zilli/. Downstream, /Cyprinodon macularius/, /Poecilia sphenops/, and /Notropis lutrensis/ were taken in flowing water.

79-002786 Schooley, J. K. STRUCTURAL ANALYSIS OF ESTUARINE FISH COMMUNITIES. Bull. Ecol. Soc. Am. 60 (2): 80. June 1979. Abstract only. SFA 24(4)
[Univ. Fla., Gainesville] Fish community organization was studied at twelve nearshore sites in Florida's Indian River, a large mesohaline lagoonal system on the east central coast. Samples were obtained monthly by quantitative beach sieving at each site. The shallow nearshore habitats were found not to be homogeneous with the seagrass beds of deeper water in either species composition or seasonality. The use of mathematical classification and ordination techniques for community structural analysis appear to make meaningful microhabitat distinctions based on species composition and abundance data. Differences in detrital material, both amount and origin as well as water depth at each site, appear to influence community composition to a greater extent than do salinity or temperature during any particular month. Temperature was found to be significant in the overall seasonal utilization of these shallow water habitats, especially for juveniles and young of the year. It is hypothesized that the juveniles of several species are using these habitats as predation sanctuaries during the summer and early fall.

79-002787 Smith, R. J. F. ALARM REACTION OF IOWA AND JOHNNY DARTERS (/ETHEOSTOMA/, PERCIDAE, PISCES) TO CHEMICALS FROM INJURED CONSPECIFICS. Can. J. Zool. 57 (6): 1278-1282. June 1979. In English with French summ. SFA 24(4)
[Biol. Dep., Univ. Saskatchewan, Saskatoon, SK S7N 0W0, Canada] Two species of darter show reduced activity when they detect chemical stimuli from an injured conspecific. This is an appropriate response to a predator warning signal in bottom dwelling fish such as darters. Predation on darters by northern pike releases sufficient chemical stimuli to elicit the reduced activity response. Skin extract is more active than muscle extract in releasing the response. Darter skin contains large, nonmucous secretory cells that may contain the alarm substance. This alarm system in percid fishes appears to be analogous to the better known alarm substance (Schreckstoff) system in ostariophysian fishes.

79-002788 Weiss, C. S.; Coughlin, J. P. MAINTAINED AGGRESSIVE BEHAVIOR IN GONADECTOMIZED MALE SIAMESE FIGHTING FISH (/BETTA SPLENDENS/). Physiol. Behav. 23 (1): 173-177. July 1979. SFA 24(4)
[Dep. Psychol., Coll. Holy Cross, Worcester, MA 01610] Adult male /Betta splendens/ were gonadectomized and tested twice for aggressive behavior two weeks later. In a mutual viewing test environment, it was found that gonadectomized animals maintained their aggressive behavior on all six indices of aggression at a level equal to controls. Animals that showed some testis regeneration and sham operated fish were also equal to controls. The results are interpreted to mean that adult aggressive behavior in male /B. splendens/ may not be under the control of gonadal hormones. Pituitary gonadotropins, interrenal gland, and critical period hypotheses are given as possible explanations of the maintained aggressiveness following castration.

79-002789 Werner, E. E.; Hall, D. J. FORAGING EFFICIENCY AND HABITAT SWITCHING IN COMPETING SUNFISHES. Ecology 60 (2): 256-264. Apr. 1979. SFA 24(4)

[W. H. Kellogg Biol. Stn., Mich. State Univ., Hickory Corners 49060] A series of experiments are presented which elucidate competitive interactions among 3 congeneric sunfishes (Centrarchidae). In the absence of competitors all species rank 2 habitats (vegetation, sediments) in the same order according to profitability but differ in their relative efficiencies at utilizing these habitats. The ordinal ranking of foraging efficiencies of these species in the 2 habitats permits qualitative predictions of the occurrence and order of habitat shifts as resources decline (competitive pressure increases). We present an experiment demonstrating such habitat shifts which corroborate these predictions. The patterns of habitat switching indicate that the addition of a competitor which is more effective in a given habitat can change the profitability ranking for a species to the extent that the preferred habitats are abandoned. Thus these results provide experimental evidence for the compression hypothesis as a mechanism for the development and maintenance of resource partitioning by habitat. Further, the ecological flexibility exhibited by the sunfish indicates that overlap or co-utilization of habitats can be a very dynamic process, determined by the relation between resource levels and differences in foraging efficiencies among species. The implications of these results to competition, optimal use of a patchy environment, and species abundance relations in natural lakes are discussed.

79-002790 Wolfe, J. R., Jr.; Helfrich, L. A.; Tipton, A. R. AGONISTIC BEHAVIOR BETWEEN BROOK AND RAINBOW TROUT IN AN ARTIFICIAL STREAM ENVIRONMENT. Va. J. Sci. 29 (2): 71. 1978. Abstract only. SFA 24(4)

[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA 24061] The impact of introduced rainbow trout on populations of native brook trout in the southeast United States is not well known. The subject of this study is the agonistic behavior expressed by both species. Wild adult trout were observed in an artificial stream environment. Twenty pairs of fishes were observed with both intraspecific and interspecific matches. Observations of dominance, activity, nipping, and feeding success were quantified and interpreted with respect to species, size, and sex. Dominance was determined by supplanting. Brook trout were dominant in nine of fourteen interspecific matches. Results of activity, nipping, and feeding success demonstrated differences between species, with rainbow trout displaying greater aggressiveness. Qualitative differences in agonistic behavior were found between species. Interspecific communication was adequate for dominance to be established in all pairs. In spite of the differences stated, brook trout were found to compete successfully with rainbow trout in a behavioral context.

79-002791 Yonemori, T.; Kawamura, G.; Kabayama, A. OBSERVATION OF HEAD MOVEMENT OF SWIMMING FISH BY THE USE OF STRAIN GAGE IMBEDDED IN FISH BODY. Bull. Jpn. Soc. Sci. Fish. 45 (3): 277-279. Mar. 1979. SFA 24(4)

[Lab. Fish. Technol., Fac. Fish., Kagoshima Univ., Kagoshima, 890 Japan]

LIFE HISTORIES-GENERAL WORKS

79-002792 Alt, K. T. CONTRIBUTIONS TO THE LIFE HISTORY OF THE HUMPBACK WHITEFISH IN ALASKA. Trans. Am. Fish. Soc. 108 (2): 156-160. Mar. 1979. SFA 24(4)
[Alaska Dep. Fish Game, Fairbanks 99701]

79-002793 Blankenbeckler, D. AGE, GROWTH, MATURATION AND PARASITE OCCURRENCE OF PACIFIC HERRING (/CLUPEA PALLASII/) FROM SOUTHEASTERN ALASKA, 1974 THROUGH 1976. Alaska Dep. Fish Game Tech. Data Rep. No. 39. 88p. 1978. SFA 24(4)
[Alaska Dep. Fish Game, Ketchikan 99901]

79-002794 Boreman, J. G., Jr. LIFE HISTORY AND POPULATION DYNAMICS OF CAYUGA INLET RAINBOW TROUT (/SALMO GAIRDNERI/ RICHARDSON). Ph.D. Dissertation, Cornell Univ. 174p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(4):1657. Oct. 1978. SFA 24(4)

79-002795 Flynn, R. B.; Hoyt, R. D. THE LIFE HISTORY OF THE TEARDROP DARTER, /ETHEOSTOMA BARBOURI/ KUEHNE AND SMALL. Am. Midl. Nat. 101 (1): 127-141. Jan. 1979. SFA 24(4)
[302 N. 17th St., Mayfield, KY 42066]

79-002796 Goeden, G. B. A MONOGRAPH OF THE CORAL TROUT /PLECTROPOMUS LEOPARDUS/ (LACEPEDE). Queensland Fish. Serv. Res. Bull. No. 1. 42p. 1978. SFA 24(4)
[Queensland Fish. Serv., P.O. Box 36, North Quay, Brisbane, Queensland 4000, Australia]

79-002797 Gordon, J. D. M.; Duncan, J. A. R. SOME NOTES ON THE BIOLOGY OF THE SNAKE BLENNY, /LUMPENUS LAMPRETAEFORMIS/ ON THE WEST COAST OF SCOTLAND. J. Mar. Biol. Assoc. U.K. 59 (2): 413-419. May 1979. SFA 24(4)
[Dunstaffnage Mar. Res. Lab., Oban, Scotland] Large catches of the snake blenny, /Lumpenus lampretaeformis/, have been made in the inshore waters of the west coast of Scotland. Analysis of these catches confirm the view that this species shows marked seasonal variations in abundance. The species lives for up to 9 years and has a rapid growth rate in the first 2 years. It feeds mainly on meiobenthic organisms, of which polychaetes, harpacticoid copepods, ostracods and nematodes are the most important. The reason for the seasonal variation in catch rate is discussed and it is speculated that it may result from the fossorial habit of the adults and the parental care of the eggs.

79-002798 Hamilton, J. G.; Powles, P. M. FEEDING HABITS AND GROWTH OF YOUNG-OF-THE-YEAR LARGEMOUTH BASS (/MICROPTERUS SALMOIDES/) NEAR ITS NORTHERN LIMIT, NOGIES CREEK, ONTARIO. Can. J. Zool. 57 (7): 1431-1437. July 1979. In English with French summ. SFA 24(4)
[Biol. Dep., Trent Univ., Peterborough, ON K9J 7B8, Canada] Two hundred and twenty-Three young-of-the-year (YOY) largemouth bass (/Micropterus salmoides/) from Nogies Creek, Ontario, grew from 15 to 110 mm total length (TL) over June 1 to October 26, 1977. Growth was rapid through June and July but diminished after August 1. Growth increments formed a single stanza pattern closely fitting the von-

79-002798 CONTINUED
Bertalanffy model, L(t) = 85.8[1-e to the -0.34(t-0.26)] and paralleling seasonal water temperatures. The summer condition index was lower for Nogies Creek YOY bass than populations reported from the United States. This was attributed in part to a shorter, cooler growing-feeding season, and some differences in diet. The most numerous food items were Cladocera. Amphipoda, Ephemeroptera, Chironomidae, and Teleostei, in order, were all of lesser importance. Cladocera, however, did not constitute as much total bulk in the diet as Ephemeroptera and Amphipoda. YOY bass selected the same variety, but larger, prey, as they grew in size. Above average (length) YOY bass fed on larger food organisms than did their smaller cohorts for each month.

79-002799 Hanson, J. M.; Qadri, S. U. SEASONAL GROWTH, FOOD, AND FEEDING HABITS OF YOUNG-OF-THE-YEAR BLACK CRAPPIE IN THE OTTAWA RIVER. Can. Field-Nat. 93 (3): 232-238. July-Sept. 1979. SFA 24(4)
[Dep. Biol., Univ. Ottawa, Ottawa, ON K1N 6N5, Canada] In the Ottawa River, during the first growing season, young-of-the-year Black Crappies (/Pomoxis nigromaculatus/) attained an average total length of 68.4 mm and a mean weight of 4.03 g. The length-weight relationship was log WT = -4.84 + 2.97 log TL. Young-of-the-year Black Crappies fed mostly on copepods and cladocerans from June to September but switched to amphipods in October. They are diurnal in habit and feed mostly on organisms in the mid-waters of the littoral zone.

79-002800 Imaoka, Y.; Misu, H. [BIOLOGY OF ROUNDNOSE FLOUNDER, /EOPSETTA GRIGORJEWI/, IN THE SOUTHWESTERN JAPAN SEA. EARLY STAGE OF DEVELOPMENT.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 6: 11-20. 1977[1978]. In Japanese with English summ. SFA 24(4)
[Fukui Fish. Exp. Stn., Urazoko, Tsuruga, Japan]

79-002801 Papageorgiou, N. K. THE LENGTH WEIGHT RELATIONSHIP, AGE, GROWTH AND REPRODUCTION OF THE ROACH /RUTILUS RUTILUS/ (L.) IN LAKE VOLVI. J. Fish Biol. 14 (6): 529-538. June 1979. SFA 24(4)
[Lab. Fish. Wildl., Sch. Agric. For., Univ. Thessaloniki, Greece] The length-weight relationship of a sample of 233 roach (/Rutilus rutilus/) can be described by the following equations: y=0.0356x to the 3.405 and y=0.0215x to the 3.606 for males and females respectively. In both equations y equals the body weight in grams and x is the standard length in centimetres. The average condition factor K was 2.01 with a range of 1.71 to 2.26. The roach's span of life was 13 years for both sexes. The growth increment is greater during the first year of life (about 56 mm), decreasing to approximately 17 mm at the end of the sixth year of life and then becoming constant at about 12 mm per year. Roach become sexually mature at age 1+ for males and one year later for females. The mean absolute fecundity was 9294 eggs; with a range from 920 to 32,810. The growth of the gonads is related to the age of the fish. Spawning occurs during the first half of April, at a mean water temperature of 10°C.

79-002802 Pflieger, W. L. DISTRIBUTION, STATUS, AND LIFE HISTORY OF THE NIANGUA DARTER, /ETHEOSTOMA NIANGUAE/. Mo. Dep. Conserv. Aquatic Ser. No. 16 24p. 1978. SFA 24(4)
[Mo. Dep. Conserv., 1110 College Ave., Columbia 65201]

79-002803 Sakamoto, T.; Suzuki, K. [SPAWNING BEHAVIOR AND EARLY LIFE HISTORY OF THE PORCUPINE PUFFER, /DIODON HOLACANTHUS/, IN AQUARIA.] Fac. Mar. Sci. Tokai Univ. Collect. Repr. 9: 225-234. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan]

79-002804 Shubnikov, D. A. CHARACTERISTICS OF THE STRUCTURE AND ECOLOGY OF COASTAL-ESTUARINE FISH OF THE INDIAN OCEAN. Sov. J. Ecol. (Engl. Transl. Ekologiya) 9 (5): 454-459. Sept.-Oct. 1978. SFA 24(4)
A series of biological adaptations were examined in fish species related to food procurement, reproduction, and defense from predators under the conditions of the turbid brackish waters of the coastal-estuarine zone of the Indian Ocean. The uniqueness of the ichthyofauna was noted. Certain characteristics of the external structure of coastal-estuarine fish and the means of caring for their young were noted.

79-002805 Suzuki, K.; Kobayashi, K.; Hioki, S.; Sakamoto, T. [ECOLOGICAL STUDIES OF THE ANTHIINE FISH, /FRANZIA SQUAMIPINNIS/, IN SURUGA BAY, JAPAN.] Fac. Mar. Sci. Tokai Univ. Collect. Repr. 9: 271-287. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan]

79-002806 Westin, D. T.; Abernethy, K. J.; Meller, L. E.; Rogers, B. A. SOME ASPECTS OF BIOLOGY OF THE AMERICAN SAND LANCE, /AMMODYTES AMERICANUS/. Trans. Am. Fish. Soc. 108 (3): 328-331. May 1979. SFA 24(4)
[Grad. Sch. Oceanogr., Univ. R.I., Kingston 02881]

79-002807 Yuen, H. , (ed.) 1977 BRISTOL BAY SOCKEYE SALMON SMOLT STUDIES. Alaska Dep. Fish Game Tech. Data Rep. No. 41. 35p. 1978. SFA 24(4)
[Alaska Dep. Fish Game, Anchorage]

POPULATION STUDIES, PRODUCTION, ETC.

79-002808 Craig, J. F.; Kipling, C.; Le Cren, E. D.; McCormack, J. C. ESTIMATES OF THE NUMBERS, BIOMASS AND YEAR-CLASS STRENGTHS OF PERCH (/PERCA FLUVIATILIS/ L.) IN WINDERMERE FROM 1967 TO 1977 AND SOME COMPARISONS WITH EARLIER YEARS. J. Anim. Ecol. 48 (1): 315-325. Feb. 1979. SFA 24(4)
[Freshwater Biol. Assoc., Ambleside, Cumbria, England] Estimates of the numbers and biomass (to 1977) and of year-class strengths (to 1975) of perch (/Perca fluviatilis/ L.) in Windermere are presented. Mortality rates for combined year-classes were higher from 1969 in the north and from 1968 in the south basin than in the previous twenty years. Mortality rates calculated for each year-class from 1955 to 1972 also showed an increase in later years. A dramatic increase in mortality occurred in 1976, when a disease, whose primary cause has not yet been identified, killed at least 98 percent of adult perch. A highly significant inverse relationship (P is less than 0.001) was found between mortality from egg to age II years and summer temperature in the first year of life. Biomass from 1967 to 1975 remained fairly high in both basins and was at a similar level to that of 1941 although far fewer fish were present in the later period. Year-class strengths were higher after 1966 than in the previous 5

79-002808 CONTINUED
years due to warm summers (the correlation between year-class strengths and temperature was highly significant P is less than 0.001).
Possible reasons for the observed changes in population numbers, biomass and year-class strengths over the period from 1941 to 1976 are discussed. The severity of the mortality in 1976 was confirmed by samples taken in 1977, when only two perch over II years old were captured.--From abstr.

79-002809 Dommasnes, A.; Midttun, I.; Monstad, T. LODDEUNDERSOKELSER I BARENTSHAVET VINTEREN 1978. [CAPELIN INVESTIGATIONS IN THE BARENTS SEA DURING THE WINTER 1978.] Fisken Havet 1979 (1): 1-16. 1979. In Norwegian with English summ. SFA 24(4)
[Fiskeridir. Havforskningsinst., Bergen, Norway]

79-002810 Dommasnes, A.; Loeng, H.; Monstad, T. LODDEUNDERSOKELSER I BARENTSHAVET HOSTEN 1978. [CAPELIN INVESTIGATIONS IN THE BARENTS SEA DURING AUTUMN 1978.] Fisken Havet 1978 (1): 17-30. 1979. In Norwegian with English summ. SFA 24(4)
[Fiskeridir. Havforskningsinst., Bergen, Norway]

79-002811 Germany, R. D.; Noble, R. L. POPULATION DYNAMICS OF BLUE TILAPIA IN TRINIDAD LAKE, TEXAS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 412-417. 1977[1979]. SFA 24(4)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] Scales from blue tilapia (/Tilapia aurea/) captured in gillnets indicated that annulus formation occurred primarily in March and April in 1973 and 1974, but in April and May 1975. Average back-calculated total lengths of males were 197 and 258 mm at Age I and II and for females 183 and 248 mm. Total population of blue tilapia in December 1974 was estimated as 4,856,963. Of this total 3,120,810 were Age 0 and 1,591,823 were Age I. Biomass of the tilapia population was estimated to be 799,978 kg or 2,640 kg/ha. Survival of blue tilapia from Age I to II was calculated to be 7 percent. From these estimates the potential yield of harvestable blue tilapia would be 1,629,501 fish weighing 521,153 kg.

79-002812 Goldspink, C. R.; Goodwin, D. A NOTE ON THE AGE COMPOSITION, GROWTH RATE AND FOOD OF PERCH /PERCA FLUVIATILIS/ (L.) IN FOUR EUTROPHIC LAKES, ENGLAND. J. Fish Biol. 14 (5): 489-505. May 1979. SFA 24(4)
[Dep. Biol. Sci., Manchester Polytech., England] The perch populations of all lakes sampled are characterised by high growth rates (l (infinity) 320-410 mm) and year-class instability. The concurrence of four year-classes (1970, 1973, 1975 and 1976) in three of the lakes is good evidence for climatic control of recruitment. Poor recruitment in Rostherne Mere during 1973 is attributed to the effects of cannibalism. An increase in the growth rate of young fish (0+) in all lakes during 1975 and 1976 is noted. The relatively poor growth of perch in Rostherne Mere is a consequence of the low specific growth rate there during the first year of life. An outbreak of the 'perch-disease' killed most of the adult perch present in 1975 in Rostherne Mere.

79-002813 King, T. A. SAMPLING FISH POPULATIONS AND EFFECTS OF FISHING AND NATURAL MORTALITY ON THE INITIAL YEAR CLASS OF LARGEMOUTH BASS IN WEST POINT RESERVOIR, ALABAMA-GEORGIA. Ph.D. dissertation, Auburn Univ. 43p. 1979. From Diss. Abstr. Int. B Sci. Eng. 39(12, part 1):5677. June 1979. SFA 24(4)

Rates of growth, fishing mortality, and natural mortality of the initial (1975) year class of largemouth bass were estimated over a two-year period by rotenone sampling, electrofishing and tagging studies. The estimate of initial standing stock in August 1975 of 1, 617 bass/hectare weighing 28.24 kg was reduced to 1.5 bass weighing 1.64 kg at the end of two years of impoundment in August, 1977. Instantaneous rate of growth, fishing mortality and natural mortality were 2.19, 1.17, and 2.78 respectively, the first year, and 0.65, 0.92 and 2.11 the second year. Total yield, to anglers, of bass from the 1975 year class was 21.38 kg/hectare, 95 percent of which was harvested during the first year of impoundment. Natural and fishing mortality, through their effects on growth, reduced the standing crop of 1975 bass by 88.2 percent (58.6 percent natural, 29.6 percent fishing) the first year and 86.2 percent (69.1 percent natural, 17.1 percent fishing) the second year. The abundant initial year class of bass was responsible for creating a fishing "boom", and population structure change brought about by high natural mortality and fishing mortality resulted in a "bust" in bass fishing after two years of impoundment.--From abstr.

79-002814 Orth, D. J. COMPUTER SIMULATION MODEL OF THE POPULATION DYNAMICS OF LARGEMOUTH BASS IN LAKE CARL BLACKWELL, OKLAHOMA. Trans. Am. Fish. Soc. 108 (3): 229-240. May 1979. SFA 24(4)

[Okla. Coop. Fish. Res. Unit, Okla. State Univ., Stillwater 74074]

79-002815 Schaefer, W. F. POPULATION DYNAMICS OF RAINBOW SMELT IN LAKE SUPERIOR. Ph.D. dissertation, Brigham Young Univ. 81p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(2):633. Aug. 1979. SFA 24(4)

Characteristics were determined for the 1973-1977 rainbow smelt, /Osmerus mordax/ (Mitchill), population in western Lake Superior. Smelt attained total lengths of 81, 131, 161, 178 and 194 mm at ages 1 through 5 respectively. The annual total mortality rate was 57 percent, and was higher in males. An extensive spring die-off of smelt occurred in the extreme western end of Lake Superior during the past several years. The most probable cause of the 1977 die-off was temperature shock to fish spawning in the harbor and subsequent osmoregulatory imbalance which weakened the fish to an asexual form of the fungus /Saprolegnia/ (probably /S. parasitica/), resulting in death. Male smelt were more vulnerable to the die-off than female smelt, while young smelt (especially females) were more resistant to the die-off.

79-002816 Shuter, B. J.; Koonce, J. F.; Regier, H. A. MODELING THE WESTERN LAKE ERIE WALLEYE POPULATION: A FEASIBILITY STUDY. Great Lakes Fish. Comm. Tech. Rep. No. 32. 40p. Apr. 1979. SFA 24(4)

[Minist. Nat. Resour., Fish. Br., Box 50, Maple, ON L0J 1E0, Canada]
A simple population model of the walleye (/Stizostedion vitreum vitreum/) of western Lake Erie was constructed from a set of empirical relationships linking growth to population density and recruitment to breeding stock size and the spring water temperature regime. Given a reasonable set of values for annual rates of natural and fishing mortalities, consistent with empirical estimates of total survival for the period 1947-75, the model generated a pattern of behavior similar, both qualitatively and quantitatively, to that exhibited by the real population. Two types of stochastic models, based on the initial

79-002816 CONTINUED
population model, were used to derive optimal harvest strategies for the population. These strategies were not sensitive to variations in catchability and natural mortality, but the estimated yields produced were highly sensitive to variations in both these factors. A refined and extended version of this model may be useful in developing management policies for this population.

79-002817 Warburton, K. GROWTH AND PRODUCTION OF SOME IMPORTANT SPECIES OF FISH IN A MEXICAN COASTAL LAGOON SYSTEM. J. Fish Biol. 14 (5): 449-464. May 1979. SFA 24(4)
[D.A.F.S. Mar. Lab., P.O. Box 101, Victoria Rd., Torry, Aberdeen AB9 8DB, Scotland] In terms of biomass, the three dominant fish species in the Huizache-Caimanero lagoon system during 1975-76 were the mullet /Mugil curema/, the anchovy, /Anchoa panamensis/ and the catfish, /Galeichthys caerulescens/. Peaks in the abundance of the secondary predators occurred at the end of the wet season (September-October), while pelagic forms and members of the centropomid-gerreid association were most common during November-February and December-February respectively. Twelve species including the ten having the highest overall mean biomass, were selected for growth and production studies. Lagoon-Specific differences in the patterns of growth and recruitment of several species were observed. The total estimated annual fish production in Caimanero lagoon was 34.48 g $m^{-2}y^{-1}$, with /M. curema/ contributing 9.36 g m^{-2}, /A. panamensis/ 9.24 g m^{-2} and /G. caerulescens 6.15 g m^{-2} (maximum estimate). Mean turnover ratios (annual production: mean biomass) were 3.25 (demersal species), 8.44 (pelagic species) and 4.48 (all species). Implications for possible fishery and aquacultural expansion are discussed.

79-002818 Wood, C. C.; Ketchen, K. S.; Beamish, R. J. POPULATION DYNAMICS OF SPINY DOGFISH (/SQUALUS ACANTHIAS/) IN BRITISH COLUMBIA WATERS. J. Fish. Res. Board Can. 36 (6): 647-656. June 1979. In English with French summ. SFA 24(4)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

79-002819 Abou-Seedo, F. S.; Potter, I. C. THE ESTUARINE PHASE IN THE SPAWNING RUN OF THE RIVER LAMPREY /LAMPETRA FLUVIATILIS/. J. Zool. (Lond.) 188 (1): 5-25. May 1979. SFA 24(4)
[Fac. Sci., Dep. Zool., Univ. Kuwait, Kuwait]

79-002820 Babiker, M. M.; Ibrahim, H. STUDIES ON THE BIOLOGY OF REPRODUCTION IN THE CICHLID /TILAPIA NILOTICA/ (L.): GONADAL MATURATION AND FECUNDITY. J. Fish Biol. 14 (5): 437-448. May 1979. SFA 24(4)
[Dep. Zool., Univ. Khartoum, Sudan] /Tilapia nilotica/ reaches maturity in the first year of life; females mature shortly before males (11.4 and 14.3 cm in length). The distinctive morphological features of the different stages of development of the gonads are characterized. The sex ratio varied in populations of different age (size)-groups: a ratio of 2.81:1 and 0.47:1 (females: males) was obtained in populations of young and old fish. In medium-sized populations the sexes were equally abundant. There is evidence that females breed more than once a season. Fecundity varied more with body length (r=0.860) and weight (r=0.806) than with age (r=0.604). These variations were of the order of 2.02, 0.83 and 0.83 exponentials of

79-002820 CONTINUED
length, weight and age, respectively.

79-002821 Bell, M. A. LOW-PLATE MORPH OF THE THREE-SPINE STICKLEBACK BREEDING IN SALT WATER. Copeia 1979 (3): 529-533. 1 Aug. 1979. SFA 24(4)
[Dep. Ecol. Evol., State Univ. N.Y., Stony Brook 11794]

79-002822 Blankenbeckler, D. PACIFIC HERRING (/CLUPEA PALLASII/) HARVEST STATISTICS AND A SUMMARY OF HYDROACOUSTICAL SURVEYS CONDUCTED IN SOUTHEASTERN ALASKA DURING THE FALL, WINTER AND SPRING, 1976-77. Alaska Dep. Fish Game Tech. Data Rep. No. 38. 149p. 1978. SFA 24(4)
[Alaska Dep. Fish Game, Ketchikan 99901]

79-002823 Blankenbeckler, D. PACIFIC HERRING (/CLUPEA PALLASII/) SPAWNING GROUND RESEARCH IN SOUTHEASTERN ALASKA, 1977. Alaska Dep. Fish Game Tech. Data Rep. No. 37. 13p. 1978. SFA 24(4)
[Alaska Dep. Fish Game, Ketchikan 99901]

79-002824 Blumer, L. S. MALE PARENTAL CARE IN THE BONY FISHES. Q. Rev. Biol. 54 (2): 149-161. June 1979. SFA 24(4)
[Mus. Zool., Univ. Mich., Ann Arbor 48109] The phenomenon of male parental care, which is unusually common in bony fishes, has been the subject of numerous evolutionary hypotheses in recent years. In an effort to evaluate these hypotheses the results of a survey of all families whose species exhibit parental care is presented. Sexual selection and female choice for male parental behavior only partially explain this phenomenon. Although females may benefit by males being the care-giving individuals, these benefits may apply equally to males when females are the care-givers. The information available suggests that the effects of care-giving on the future reproduction of the male and the male's probability of genetic relatedness to his mate's offspring are major factors in the evolution and maintenance of male parental behavior. The costs of care-giving are minimized by mating strategies that enable males to give parental care and pursue further mating simultaneously. Male fishes with external fertilization often attain a relatively high probability of genetic relatedness to the offspring at the oviposition site. This is a precondition for the evolution and maintenance of parental behavior.

79-002825 Burr, B. M. OBSERVATIONS ON SPAWNING AND BREEDING COLORATION OF /MOXOSTOMA LACHNERI/ IN CHATTAHOOCHEE RIVER, GEORGIA. Ga. J. Sci. 37 (3/4): 205-207. June-Sept. 1979. SFA 24(4)
[Dep. Zool., South. Ill. Univ., Carbondale 62901] Greater jumprock fish were observed spawning on 10 and 11 June 1976, in Chattahoochee River, Georgia, at 19°C in a manner similar to that described for non-nest-building species of /Moxostoma/. Spawning occurred in a gravel-bottomed trough in clear, rapid water. Bluish-gray breeding colors were developed on spawning individuals.

79-002826 Clay, D. SEXUAL MATURITY AND FECUNDITY OF THE AFRICAN CATFISH (/CLARIAS GARIEPINUS/) WITH AN OBSERVATION ON THE SPAWNING BEHAVIOUR OF THE NILE CATFISH (/CLARIAS LAZERA/). Zool. J. Linn. Soc. 65 (4): 351-365. Apr. 1979. SFA 24(4)

[Dep. Zool., Univ. Reading, Berkshire, England] The African catfish, /Clarias gariepinus/, from Lakes Kariba, McIlwaine and Kyle, was investigated for sexual maturity and fecundity. Sexual maturity is cyclical and seasonal, with a peak coinciding with the seasonal summer rains. Development from non-ripe adult fish to those in the ripe stages is shown to take less than one month. Descriptions of the stages of development are given. A line separating ripe and non-ripe groups of fish has the formula: $FL=0.5\ FS$ where FL is the number of large ova and FS is the number of small ova. The fecundity of ripe fish is related to length (total length=TL) by the cubic function $F=0.04TL\ (cm)^{3.39}$. The ova have a bimodal size distribution, suggesting the possiblity of multiple spawning cycles in any one year. Spawning capability is very closely related to ovary weight. Spawning behaviour in the Nile catfish, /Clarias lazera/, follows the pattern of /C. gariepinus/.

79-002827 Constantz, G. D. LIFE HISTORY PATTERNS OF A LIVEBEARING FISH IN CONTRASTING ENVIRONMENTS. Oecologia (Berl.) 40 (2): 189-201. 27 June 1979. SFA 24(4)

[Acad. Nat. Sci., 19th and Parkway, Philadelphia, PA 19103] The population dynamics and energy allocations of the Gila topminnow, a small livebearing fish, were studied in two contrasting environments, a spring run of constant characteristics and a fluctuating desert wash. Topminnows grew and matured in two basic patterns. First, many fish in both areas matured the year after their birth. Second, spring fish born early in the breeding season grew rapidly, bred within five months, and died by eight months of age. Although spring fish assimilated more energy, wash fish actually expended more calories for growth and reproduction, partly because of lower maintenance costs. Reproductive effort of long-lived spring fish varied with age between 3.1 and 6.5 percent; whereas efforts of short-lived spring and wash fish increased steadily with age to 5.2 and 9.8 percent, respectively. Although spring fish produced eggs of higher energy content, females in both areas varied their investment per offspring, apparently tracking seasonal changes in the availability of food for fry. When long-lived spring fish experienced food shortage, they allocated less energy to both growth and reproduction; in contrast, wash and short-lived spring fish under similar conditions reduced only their growth allocation. The reproductive mass in spring fish appeared to be limited by food availability, incompletely filled the abdominal space, and reflected no tradeoff between fecundity and investment per offspring. Reproduction by wash fish appeared to be limited by body space and was characterized by a tradeoff between fecundity and egg size.

79-002828 Daniels, R. A. NEST GUARD REPLACEMENT IN THE ANTARCTIC FISH /HARPAGIFER BISPINIS/: POSSIBLE ALTRUISTIC BEHAVIOR. Science 205 (4408): 831-833. 24 Aug. 1979. SFA 24(4)

[Dep. Wildl. Fish. Biol., Univ. Calif., Davis 95616] Nesting biology of the Antarctic plunder fish, /Harpagifer bispinis/ (Schneider), was examined at Arthur Harbor, Antarctic Peninsula, during the austral winter, 1975. Females prepare nest sites, spawn, and guard the eggs for 4 to 5 months, the longest guarded incubation period reported for any fish species. If this guard is removed, it is soon replaced by a conspecific, usually male. If the second guard is removed, a third replaces it. Guards are essential to ensure nest survival. Selfish or parental acts or acts of kinship or reciprocity

79-002828 CONTINUED
do not adequately explain guard replacement. The act may be altruistic.

79-002829 Farringer, R. T. III; Echelle, A. A.; Lehtinen, S. F. REPRODUCTIVE CYCLE OF THE RED SHINER, /NOTROPIS LUTRENSIS/, IN CENTRAL TEXAS AND SOUTH CENTRAL OKLAHOMA. Trans. Am. Fish. Soc. 108 (3): 271-276. May 1979. SFA 24(4)
[A. Echelle: Biol. Dep., Baylor Univ., Waco, TX 76706]

79-002830 Gross, M. R. CUCKOLDRY IN SUNFISHES (/LEPOMIS/: CENTRARCHIDAE). Can. J. Zool. 57 (7): 1507-1509. July 1979. In English with French summ. SFA 24(4)
[Dep. Biol., Univ. Utah, Salt Lake City 84112] Male sunfishes build nests and provide care for eggs spawned therein. It is shown here that small non-nesting male pumpkinseed (/Lepomis gibbosus/) and bluegill (/L. macrochirus/) will intrude during conspecific spawnings, to fertilize eggs. Such behaviour cuckolds the males which care for the brood.

79-002831 Hixon, M. A. TERM FETUSES FROM A LARGE COMMON THRESHER SHARK, /ALOPIAS VULPINUS/. Calif. Fish Game 65 (3): 191-192. July 1979. SFA 24(4)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106]

79-002832 Hubert, W. A.; Mitchell, V. P., Jr. OVARIAN DEVELOPMENT OF SMALLMOUTH BASS IN PICKWICK RESERVOIR. J. Ala. Acad. Sci. 50 (2): 87-95. Apr. 1979. SFA 24(4)
[TVA, Muscle Shoals, AL 35660] The sexual maturity and seasonal ovarian development of 202 smallmouth bass from Pickwick Reservoir were evaluated. Most fish did not mature sexually until their fourth year, although a few were sexually mature at three years. Ova, in sexually mature individuals, were found in all stages of development. Two distinct size groups of ova were observed prior to spawning; only a portion of the larger group ripened fully at any one time. Following the spawning season residual ova were observed in September. Throughout the ova maturation process larger fish were advanced over smaller, but still sexually mature ones. Smallmouth bass produced larger ova, but a smaller number per unit of total length, than either largemouth or spotted bass.

79-002833 Inoue, M. [TUNA SPAWNING SURVEY IN THE TROPICAL SEA MADE BY R/V TOKAIDAIGAKU MARU II AND R/V BOSEI MARU.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 173-180. 1974[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka-ken, Japan]

79-002834 Jakobsen, T. SKREIINNSIGET I LOFOTEN I 1978. [THE SPAWNING MIGRATION OF ARCTIC COD IN LOFOTEN IN 1978.] Fisken Havet 1979 (2): 19-28. 1979. In Norwegian with English summ. SFA 24(4)
[Fiskeridir. Havforskningsinst., Bergen, Norway]

79-002835 MacGregor, R.; Greeley, M. S.; Trimble, W. C.; Tatum, W. M. A COMPARISON OF THE ANNUAL CYCLE OF REPRODUCTION IN /FUNDULUS GRANDIS/ COLLECTED FROM A NATURAL ESTUARY AND BRACKISH WATER PONDS. J. Ala. Acad. Sci. 50 (3): 113. July 1979. Abstract only. SFA 24(4)
[Dep. Biol., Univ. Ala., Birmingham 35294]

79-002836 Murdy, E. O.; Wortham, J. W. E., Jr. CONTRIBUTIONS TO THE REPRODUCTIVE BIOLOGY OF THE PIRATEPERCH, /APHREDODERUS SAYANUS/. Va. J. Sci. 29 (2): 66. 1978. Abstract only. SFA 24(4)
[Dep. Biol. Sci., Old Dominion Univ., Norfolk, VA 23508] The purpose of this study was to describe the micro and macro-anatomy of the reproductive system and the testicular and ovarian development in /Aphredoderus sayanus/. Specimens were collected at least once a month from September, 1976, through May, 1977, in Cypress Pond, a part of the Dismal Swamp drainage, outside of Suffolk, Virginia. Forty-three specimens had their gonads examined histologically, of these 13 were males, 29 were females and in one specimen the sex was not determinable. All specimens were also assessed according to their gonosomatic index (GSI) which was the ratio of the total weight of the gonads to total body weight. An unknown structure was discovered in the ovaries of two specimens. This structure, which was found in several areas of the ovary, bore no resemblance to any structure that had previously been discussed in the literature. /Aphredoderus sayanus/ is a spring spawner, spent gonads were found on and after April 13, 1977. Gonads began to ripen in the fall, testes maturing sooner than ovaries. Sperm was seen in November males, ripe eggs were not seen until April 1, 1977. No ripe males or females were collected after April 30.

79-002837 Okada, H.; Sakai, D. K.; Sugiwaka, K. [CHEMICAL STIMULUS ON THE REPRODUCTIVE BEHAVIOR OF THE POND SMELT.] Sci. Rep. Hokkaido Fish Hatchery 33: 89-99. Dec. 1978. In Japanese with English summ. SFA 24(4)
[Hokkaido Fish Hatchery, Hokkaido, Japan]

79-002838 Platts, W. S.; Shirazi, M. A.; Lewis, D. H. SEDIMENT PARTICLE SIZES USED BY SALMON FOR SPAWNING WITH METHODS FOR EVALUATION. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-79-043. v + 33p. Apr. 1979. SFA 24(4)
[Intermountain For. Range Exp. Stn., U.S. For. Serv., Ogden, UT 84401] Chinook salmon selected sediments for spawning that were mainly between .28 and .79 in (7.0 to 20 mm) in geometric mean particle diameter, regardless of stream selected. This is a narrow range considering that the mean particle diameters for streambed sediments available for chinook salmon to spawn in vary from less than 0.02 in (.5 mm) to well over 3.94 in (100 mm). The composition of spawning sediments selected by chinook salmon each year between 1966 and 1976 were quite uniform. Sediments used for spawning in the South Fork Salmon River decreased in particle size in a downstream direction. Geometric mean diameters 35 miles below the headwaters averaged .35 in (8.8 mm); particles 10 miles below the headwaters averaged .58 in (14.7 mm).--From abstr.

79-002839 Suzuki, K.; Hioli, S. [SPAWNING BEHAVIOR, EGGS, AND LARVAE OF THE SEA BREAM, /GYMNOCRANIUS GRISEUS/, IN AN AQUARIUM.] Fac. Mar. Sci. Tokai Univ. Collect. Repr. 9: 263-269. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan]

79-002840 Suzuki, K.; Hioki, S.; Tanaka, Y.; Iwasa, K. [SPAWNING BEHAVIOR, EGGS, LARVAE, AND SEX REVERSAL OF TWO POMACANTHINE FISH, /GENICANTHUS LAMARCK/ AND /G. SEMIFASCIATUS/, IN THE AQUARIUM.] J. Fac. Mar. Sci. Technol. Tokai Univ. No. 12. p. 149-165. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Japan]

79-002841 Tippets, W. E. EVIDENCE OF SUCCESSFUL REPRODUCTION OF STEELHEAD RAINBOW TROUT, /SALMO GAIRDNERI GAIRDNERI/ IN THE VENTURA RIVER, CALIFORNIA. Calif. Fish Game 65 (3): 177-179. July 1979. SFA 24(4)
[2508 Warrego Way, Sacramento, CA 95826]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

79-002842 Carlson, J. E.; Duever, M. J. SEASONAL FISH POPULATION FLUCTUATIONS IN SOUTH FLORIDA SWAMP. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 603-611. 1977[1979]. SFA 24(4)
[Ecosyst. Res. Unit, Natl. Audubon Soc., Naples, Fl] We monitored fish populations in a southwest Florida cypress (/Taxodium distichum/) strand system through an annual wet season-dry season cycle. Populations increased from zero when the site was inundated to densities of 3-8 fish m^2 and biomass of .3-.4 g/m^2 in late wet season. Two months after drydown began, fish became concentrated. In wet prairie and "pond" cypress habitats concentration continued until the sites went dry, but "bald" cypress populations reached high densities early, then stabilized until just prior to complete drydown, when they decreased drastically. Wet season populations were probably controlled by hydrologic factors, but predation was important in determining dry season density, biomass, and species composition.

79-002843 Cole, R. A. LARVAL FISH DISTRIBUTIONS IN SOUTHWESTERN LAKE ERIE NEAR THE MONROE POWER PLANT. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-069. viii + 65p. July 1978. SFA 24(4)
[Dep. Fish. Wildl., Mich. State Univ., East Lansing 48824]

79-002844 Hanamoto, E. [FISHERY OCEANOGRAPHY OF STRIPED MARLIN--IV. SWIMMING LAYER IN THE TUNA LONGLINE FISHING GROUNDS.] Bull. Jpn. Soc. Sci. Fish. 45 (6): 687-690. June 1979. In Japanese with English summ. SFA 24(4)
[Kanagawa Pref. Fish. Exp. Stn., Jogashima, Muira-city 238-02, Japan]

79-002845 Kawamura, H. [BAIT ORGANISMS, HABIT AND SEAWARD MIGRATION OF CHUM SALMON FRY DURING THE LIBERATED PERIOD IN THE UTABETSU RIVER.] Sci. Rep. Hokkaido Fish Hatchery 33: 27-44. Dec. 1978. In Japanese with English summ. SFA 24(4)
[Hokkaido Fish Hatchery, Hokkaido, Japan]

79-002846 Peterson, D. C.; Myhr, A. I. III ULTRASONIC TRACKING OF SMALLMOUTH BASS IN CENTER HILL RESERVOIR, TENNESSEE. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 618-624. 1977[1979]. SFA 24(4)
[Tenn. Wildl. Resour. Agency, Morristown 37814] Ultrasonic tracking was conducted on 11 smallmouth bass (/Micropterus dolomieui/ Lacepede) in Center Hill Reservoir, TN from 24 May 1973 to 25 July 1974. Transmitters which had an average life of 30.4 days, were implanted in the body cavity and were a successful tool for studying fish movement and behavior. Factors observed were "homing" behavior of displaced fish, horizontal movement, distance ranged offshore, depth ranges, water temperature, and habitat preference. Also determined were correlations between fish movement and water temperature, barometric pressure, water turbidity, water levels, percentage cloud cover, solunar periods, and creel census data. The effects of noise and artificial light on smallmouth bass behavior were noted. Increased movement and activity were associated with water surface temperature between 11.1 and 23.9 C. Only surface temperature of the water was found to be significantly related to rate of fish movement. The mean horizontal distance moved per day was 345 m.

79-002847 Powles, H. LARVAL DISTRIBUTIONS AND RECRUITMENT HYPOTHESES FOR SNAPPERS AND GROUPERS OF THE SOUTH ATLANTIC BIGHT. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 362-371. 1977[1979]. SFA 24(4)
[Mar. Resour. Res. Inst., S. Car. Wildl. Mar. Resour. Dep., Charleston 29412] Present taxonomic status permits discussion of larvae of vermilion snapper (/Rhomboplites aurorubens/), other snappers combined (Lutjanidae), and all groupers combined (Serranidae, subfamily Epinephelinae). Larvae of these groups together comprise less than 1 percent of the total larval fish catch from neuston and bongo samplers in shelf waters of the South Atlantic Bight. Larvae of groupers and snappers are most abundant in spring and summer respectively. Larvae are distributed in outer shelf and upper slope waters, where current is northerly. Northerly current may predominate in affecting larval drift (in which case populations may primarily be recruited from the Caribbean or Gulf of Mexico) or a significant proportion of larvae spawned in the Bight may be retained by currents throughout development to settling.

79-002848 Sopuck, R. D. EMIGRATION OF JUVENILE RAINBOW TROUT IN CAYUGA INLET, NEW YORK. N.Y. Fish Game J. 25 (2): 108-120. July 1978. SFA 24(4)
[Dep. Renewable Resour. Transport. Serv., P.O. Box 2550, The Pas, Manitoba R9A 1M4, Canada] Rainbow trout were captured by means of a downstream trap incorportated into an existing fishery on Cayuga Inlet (N.Y.) from August 1, 1973 to August 1, 1974. A total of 114 juveniles were captured, 79 percent of which emigrated between May 9 and June 6. Emigration occurred on rising water temperature and falling water level. Of the emigrants, 61, 23 and 16 percent were age 1+, age 2+ and age 3+, respectively. Among the age 1+ fish, emigrants were larger at the formation of the first annulus and had more widely spaced circuli than did non-emigrants of the same year class.

79-002849 Tanaka, S. MIGRATION MODEL AND POPULATION DYNAMICS OF LARGE-SIZED YELLOWTAILS IN THE PACIFIC OCEAN ALONG THE JAPANESE COAST INFERRED FROM TAGGING EXPERIMENTS--I. SAME YEAR RECAPTURES. Bull. Jpn. Soc. Sci. Fish. 45 (3): 297-303. Mar. 1979. SFA 24(4)
[Ocean Res. Inst., Univ. Tokyo, Nakano, Tokyo 164, Japan] A migration system model was constructed on the basis of information obtained from the tagging experiments. Two migration routes start from Sagami Bay and Kumano-nada area, central Japan. One is southward migration in spring in the direction of Kyushu, and the other is northward migration in summer to northern Japan. Recapture data within the year of release were applied to this system model and the fishing rate, transfer rate, and the rate of disappearance were estimated. In 1926-1938 period, about 80 percent of southward migrants disappeared from both Kumano-nada and Tosa Bay and discontinuity of the distribution of the population at these points was suggested. In 1963-1965 period the boundary at Kumano-nada disappeared and 85 percent of fish moved south from there toward Tosa Bay. More than a half of the fish which once disappeared from Sagami Bay and Kumano-nada in the spring season reappeared in northern Japan in summer. The fishing rate for southward migrants in the spring season was about 20 percent in 1926-1938 period, but in 1963-1965 the rate increased to more than 30 percent in Sagami Bay and Kumano-nada. The fishing rate was low in Northern Japan being not more than 10 percent in both periods.

79-002850 Tsuruta, Y. FIELD OBSERVATIONS ON THE IMMIGRATION OF LARVAL STONE FLOUNDER INTO THE NURSERY GROUND. Tohoku J. Agric. Res. 29 (3-4): 136-145. Dec. 1978. SFA 24(4)
[Dep. Fish. Sci., Tohoku Univ., Sendai, Japan] The mechanism whereby the stone flounder larvae immigrate into the nursery ground was investigated in the estuary of the Nanakita River streaming into Sendai Bay. In larva collections by the larva net suspended in the strong tidal currents, larvae were collected for two months from late January to mid-March. These larva collections were most abundant during a short period of mid-February when larval density averages 262 in 10 cubic meters of water. Most of the collected larvae ranged from 11 to 14 mm in length, and were at metamorphosis. A characteristic in metamorphosis is the left eye moving to the upper margin of head. Larvae before and after metamorphosis were scarce. Larvae were most abundant at night flood, but scarce at night ebb and in the daytime. At flood tide, an abrupt increase in the number of larvae was observed after sunset by about five times, as a maximum value, of that in the day-time and an extreme decrease occurred a little before dawn.

FOODS AND FEEDING

79-002851 Angermeier, P. L. COMPETITION FOR FOOD WITHIN A GUILD OF ILLINOIS STREAM FISHES. Bull. Ecol. Soc. Am. 60 (2): 112. June 1979. Abstract only. SFA 24(4)
[Univ. Ill., Urbana] The food habits of fishes using two raceway habitats were monitored from March 1977 through April 1978. Invertebrate availability was concurrently monitored with drift and benthic samples. Indices of diet breadths and overlaps were calculated for nine invertivore fishes during each sampling period. The indices were based on resource states defined by combinations of prey taxa and size, and weighted by relative abundances. Diet breadths are not particularly responsive to short term fluctuations in food availability, but do generally show strong seasonal differences due to fluctuations in the activity levels of fishes. These fluctuations are

79-002851 CONTINUED
somewhat asynchronous among fish species, and are closely assocaited with the annual breeding cycle. Interactions between activity levels and diet breadths result in a positive correlation between interspecific diet overlap and food availability. The observed patterns suggest a negative correlation between diet overlap and competitive stress among these stream fishes.

79-002852 Bell, J. D. OBSERVATIONS ON THE DIET OF RED MORWONG, /CHEILODACTYLUS FUSCUS/ CASTELNAU (PISCES: CHEILODACTYLIDAE). Aust. J. Mar. Freshwater Res. 30 (1): 129-133. Feb. 1979. SFA 24(4)
[New South Wales State Fish., P.O. Box N211, Grosvenor St., Sydney, N.S.W. 2000, Australia] Stomach contents of 104 /C. fuscus/ (of 275-415 mm standard length) from rocky reef habitats in the Sydney region were analysed. This species was found to be entirely carnivorous, polychaetes, brachyurans, amphipods, gastropods and bivalves comprising the major food types and dominating the diet throughout the year. However, the relative proportions of these food types in the diet were found to vary considerably on a seasonal basis.

79-002853 Beumer, J. P. FEEDING AND MOVEMENT OF /ANGUILLA AUSTRALIS/ AND /A. REINHARDTII/ IN MACLEODS MORASS, VICTORIA, AUSTALIA. J. Fish Biol. 14 (6): 573-592. June 1979. SFA 24(4)
[Fish. Wildl. Div., Arthur Rylah Univ. Environ. Res., Brown St., Heidelberg, Victoria, Australia 3084] Feeding and movement of /Anguilla australis/ Richardson, and /A. reinhardtii/ Steindachner, were studied in Macleods Morass, Gippsland, Victoria from July 1975 to March 1977. Stomach fullness varied seasonally. Both species ingested a wide range of items with teleosts and insects forming the major group for /A. australis/ and teleosts the major group for /A. reinhardtii/, which fed on a narrower range of items. No relationship between size of items ingested and size of eel was evident. Kendall rank correlation coefficients indicate that both intraspecific and interspecific differences in diets due to seasonal and size variations were usually insignificant. Tagged eels were recaptured at the overall rate of 18.5 percent; of 1051 eels released, a total of 194 eels was recaptured. Maximum linear distance travelled by two eels was 3715 m while maximum days at liberty was 643 days. Home range was in the order of 400 m. No relationship between length of a tagged individual and days liberty or with distance moved was evident. Movement was closely related to fluctuations of water temperature with peaks being associated with feeding in the littoral zone of the Morass.

79-002854 Chatterji, A.; Siddiqui, A. Q.; Khan, A. A. STUDIES ON THE AGE AND GROWTH OF THE BATA, /LABEO BATA/ (HAM.) (CYPRINIDAE, TELEOSTEI) FROM THE RIVER KALI, INDIA. Hydrobiologia 63 (2): 167-176. 2 Apr. 1979. SFA 24(4)
[Sect. Ichthyol. Fish., Dep. Zool., Aligarh Muslim Univ., Aligarh-202001, India] Age and growth of /Labeo bata/ (Ham.) was studied by the analysis of annuli found on the scale and by length-frequency distribution. The fish attained lengths of 131, 194, 236, 277, 314, 341 and 364 mm at the end of the 1st, 2nd, 3rd, 4th, 5th, 6th and 7th years of life respectively. The increase in length of fish, and regression analysis yielded a straight line between scale and body length. Calculated values could be expressed as: Y = -2.534 + 0.064 X. The growth rate of the fish was found high during the 1st and 2nd years and decreased gradually afterwards till the 7th year. Both sexes showed more or less similar growth rate and attained a similar longevity. Growth trend of the fish confirmed the von Bertalanffy growth equation: Lt = 450(i-e to the -0.2165(t + 0.5963)). The seasonal growth curve was chiefly influenced by feeding intensity in

79-002854 CONTINUED
fishes of 1st year class while in adults it was affected by feeding intensity as well as by maturation of the gonads.

79-002855 Coomer, C. E., Jr.; Holder, D. R.; Swanson, C. D. A COMPARISON OF THE DIETS OF REDBREAST SUNFISH AND SPOTTED SUCKER IN A COASTAL PLAIN STREAM. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 587-596. 1977[1979]. SFA 24(4)
[Ga. Dep. Nat. Resour., Fish. Sect., P.O. Drawer 1528, Waycross 31501] The diets of redbreast sunfish (/Lepomis auritus/) and spotted sucker (/Minytrema melanops/) in the Satilla River, Georgia, were shown to be quantitatively different using Spearman rank correlation coefficients. The index of overlap of Pianka by number and weight showed considerable overlap in the diet during the fall. Chironomids were the main food component contributing to this overlap. The index of electivity of Ivlev indicated moderate to high selectivity by both species for chironomids in the winter, spring, and summer and some selectivity in the fall. The diet overlap between the 2 species was not considered to be a problem.

79-002856 Covich, A. P.; Knezevic, B. SIZE-SELECTIVE PREDATION BY FISH ON THIN-SHELLED GASTROPODS (/LYMNAEA/); THE SIGNIFICANCE OF FLOATING VEGETATION (/TRAPA/) AS A PHYSICAL REFUGE. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2172-2177. 1978. SFA 24(4)
[Dep. Zool., Univ. Okla., Norman 73019]

79-002857 Dahle, T. F. III OBSERVATIONS OF FINGERLING CHINOOK SALMON IN THE STOMACHS OF YELLOW PERCH FROM THE KLAMATH RIVER, CALIFORNIA. Calif. Fish Game 65 (3): 168. July 1979. SFA 24(4)
[4556 Myrtle Ave., Eureka, CA 95521]

79-002858 Dewan, S.; Miah, J. U.; Sarker, A. L.; Saha, S. N. SEASONAL PATTERNS OF FEEDING OF JUVENILE MAJOR CARP, /LABEC ROHITA/ (HAM.) IN A BANGLADESH POND. J. Fish Biol. 14 (6): 511-515. June 1979. SFA 24(4)
[Dep. Aquicult. Manage., Fac. Fish., Bangladesh Agric. Univ., Mymensingh, Bangladesh] The results of the studies on the seasonal patterns of feeding of 203 /Labeo rohita/ (Ham.) taken by cast and seine net for one year from a Bangladesh pond are presented. Studies were based on the frequency of occurrence and the points method. A change in the volume of food with change of seasons was noted. The amounts of food eaten were greater for the warmer than for other months and very low during winter indicating an upturn in late spring with a higher level continuing during the summer. Organic detritus formed the bulk of the gut contents throughout the study period. On a seasonal basis, phytoplankton and aquatic macrophytes were the group of organisms frequently ingested but the former was more important. Animal food was scarce but appreciable quantities of sand and mud were found.

79-002859 Fontaine, T. D. III COMMUNITY METABOLISM PATTERNS AND A SIMULATION MODEL OF A LAKE IN CENTRAL FLORIDA. Ph.D. dissertation, Univ. Fla. 436p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(12, part 1):5737. June 1979. SFA 24(4)
Metabolism measurements were made and a model was developed and simulated to help understand food chain dynamics and the carbon and phosphorus cycles of a nutrient enriched, warm temperate lake which has significant growth of aquatic weeds. Effects of adding white amur (/Ctenopharyngodon idella/) into the lake were projected by the

79-002859 CONTINUED
ecosystem model. In the model, the addition of white amur accelerated the decline of submersed plant biomass. As a result, the transfer of phosphorus into the water column also decreased which in turn accelerated the reduction in phytoplankton biomass and productivity. Consumers that depended most heavily on the pelagic-grazing food chain decreased while consumers that depended most heavily on the benthic-detrital food chain showed little change. Ecosystem gross production and respiration decreased at a fairly constant rate over a ten year period but net ecosystem production (community gross production minus community respiration) remained essentially the same as in baseline simulations. Hence, the percentage of gross production that became net production increased and the ecosystem was set back to an earlier stage of succession.--From abstr.

79-002860 Gardner, M. B.; Miller, J. M. OPTIMAL FORAGING AND SIZE-SELECTION BY PLANKTIVOROUS FISH. Bull. Ecol. Soc. Am. 60 (2): 113. June 1979. Abstract only. SFA 24(4)
[N.C. State Univ., Raleigh] Bluegills feeding on 2 size-classes of /Daphnia pulex/ under turbidity conditions ranging from 0-190 NTU fed preferentially on the larger size-class. The selectivity index, the proportion of large prey eaten, remained constant at 0.70 across all treatments. Turbidity levels were adjusted to remove possible perceptual bias and reduce encounter rates (the number simultanously seen) to less than or equal to /Daphnia//unit of search time. The selectivity index was independent of prey density, and the inclusion of the small size-class in the diet was dependent on the density of the preferred size. Since it has been shown that net value increases with the size of /Daphnia/, the fish in these experiments behaved as predicted by optimal foraging theory. These data suggest that the fish "knew" the value of each prey item and either chose or ignored /Daphnia/ accordingly, thus validating an implicit, but crucial, assumption of optimal foraging theory.

79-002861 Gatz, A. J., Jr. ECOLOGICAL MORPHOLOGY OF FRESHWATER STREAM FISHES. Tulane Stud. Zool. Bot. 21 (2): 91-124. 20 June 1979. SFA 24(4)
[Dep. Zool., Ohio Wesleyan Univ., Delaware 43015] Variation and interrelations of 56 morphological features were studied in 44 species of stream-living fishes. The morphological characters are interpreted ecologically based on information in the literature, character correlations, factor analysis, gut content analyses, and field observations. The results show extensive significant linear correlations among many of the characters. A number of multiple associations were identified and ranked in the factor analysis. The ecological meanings of these latter results are that the major morphological trends in these fishes are: (1) differentiation in feeding strategy between "lie-in-wait" biting predators and cruising suction feeders; (2) habitat separation according to water velocity; (3) vertical habitat separation; and (4) feeding differentiation between small insectivores and large omnivores. Gut content data were also examined by factor analysis. The results showed that for these freshwater stream fishes, size of prey is the most important component in separating the diets of different species and vertical position of the prey is the second most important component. Various correlations between the size and location of the prey and several morphological characteristics are also discussed.

79-002862 George, E. L.; Hadley, W. F. FOOD AND HABITAT PARTITIONING BETWEEN ROCK BASS (/AMBLOPLITES RUPESTRIS/) AND SMALLMOUTH BASS (/MICROPTERUS DOLOMIEUI/) YOUNG OF THE YEAR. Trans. Am. Fish. Soc. 108 (3): 253-261. May 1979. SFA 24(4)
[Bio Systems Res., Inc., 455 Cayuga Rd., Buffalo, NY 14255]

79-002863 Gosee, C. K.; Greenwald, L.; Stein, R. A. A METHOD FOR MEASURING CALORIC COSTS OF FORAGING ACTIVITIES IN FISHES. Bull. Ecol. Soc. Am. 60 (2): 114. June 1979. Abstract only. SFA 24(4)
[Ohio State Univ., Columbus] Tests of optimal foraging theory assume that predator costs measured as time spent searching, pursuing, and handling are proportional to calories expended. To determine if time is a reliable index of caloric costs, we developed a technique for measuring metabolic rates over time intervals too short for accurate oxygen consumption measurements. A 100 g fish is injected with 0.3 ml of NaH^{14}CO(3) (150 uCi, pH 8). The water of the experimental aquarium (34 l) is serially sampled and analyzed by liquid scintillation counting to determine excretion rate of ^{14}CO(2). The slope of "l"n delta cpm vs time is percent ^{14}CO(2) turnover which equals percent total CO(2) turnover. Oxygen consumption can then be inferred by using correlations of measured oxygen consumption rates and percent ^{14}CO(2) turover previously obtained in a small system (2.4 l). This technique is being used to measure caloric costs of handling and search to redear sunfish (/Lepomis microlophus/) preying on snails for comparisons of caloric and time cost/benefit ratios.

79-002864 Henry, R. L. III PREY SIZE UTILIZATION IN A COMMUNITY OF SOUTHEASTERN FISHES. Bull. Ecol. Soc. Am. 60 (2): 113. June 1979. Abstract only. SFA 24(4)
[Univ. Ga., Athens] The prey size relationships of eight dominant fishes in the Satilla River, Georgia were examined from December 1974 to November 1975. Fishes were collected by electroshock once every two months and prey utilization estimated by gut analysis. Three types of carnivory were observed: 1) Piscivores; Chain Pickerel and Largemouth Bass, 2) Insectivores; Bluegill, Redbreast, Spotted Sunfish, Pirate Perch and Spotted Sucker and 3) Crayfish feeders; Warmouth adn Largemouth Bass. Within the piscivore and crayfish feeding groups, clear prey size differences were found. Among the insectivores, these differences were less evident but still observable. In general, the rank from largest to smallest prey size was as follows: Chain Pickerel, Largemouth Bass, Warmouth, Redbreast, Bluegill, Spotted Sunfish, Pirate Perch and Spotted Sucker.

79-002865 Ishiwata, N. [ECOLOGICAL STUDIES ON THE FEEDING OF FISHES--X. AN ESTIMATION OF DAILY RATION IN NATURE.] Bull. Jpn. Soc. Sci. Fish. 45 (5): 561-565. May 1979. In Japanese with English summ. SFA 24(4)
[Tokyo Univ. Fish., Minato-ku, Tokyo 108, Japan] The daily ration of fish in nature is estimated from a comparison between the growth rate of fish in nature in aquaria. The growth rate of 0-year-old jack mackerel, /Trachurus japonicus/ caught off the coast of Koajiro, Kanagawa Prefecture, indicates 0.249 and 0.172 g/day in 1957 and 1958 respectively. On the other hand, the growth rate of 0-year-old jack mackerel fed to satiation on pieces of jack mackerel meat once a day indicates 0.501 g/day, and the growth rates of the fish fed on the food of 2/3 and 1/3 of the satiation amount indicate 0.350 and 0.154 g/day respectively. The growth rates of the fish in nature in 1957 and 1958 fall between those of the 2/3 and 1/3 satiation groups. At this water temperature, the satiation amount of the fish for one feeding a day is about 9 percent of body weight, therefore, in these waters the

79-002865 CONTINUED
daily ration of the fish will be estimated at 3 to 6 percent of body weight. Juvenile jack mackerel appear from the beginning of April together with juvenile sardines, and they take food and grow until summer in these waters. The growth rate of the fish will be closely connected with the amount of food in these waters. If the above estimation is correct, in these waters there is not sufficient food to satiate the fish even once a day and they will not attain their maximum growth rate.

79-002866 Jacobs, J. INFLUENCE OF PREY SIZE, LIGHT INTENSITY, AND ALTERNATIVE PREY ON THE SELECTIVITY OF PLANKTON FEEDING FISH. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2461-2466. 1978. SFA 24(4)
[Zool. Inst. Univ., Luisenstr. 14, D-8000 Muchen 2, West Germany]

79-002867 Kaeriyama, M.; Sato, S. [STUDIES ON A GROWTH AND FEEDING HABIT OF THE CHUM SALMON FRY DURING SEAWARD MIGRATION IN THE TOKACHI RIVER SYSTEM--III. RELATIONSHIPS BETWEEN MIGRATION TIME AND THE GROWTH OR THE FEEDING BEHAVIOR OF THE FRY DURING 1977.] Sci. Rep. Hokkaido Salmon Hatchery No. 33. p. 47-73. Mar. 1979. In Japanese with English summ. SFA 24(4)
[Kesennuma Miyagi Pref. Fish. Exp. Stn., Japan]

79-002868 Kaeriyama, M. [STUDIES ON A GROWTH AND FEEDING HABIT OF THE CHUM SALMON FRY DURING SEAWARD MIGRATION IN THE TOKACHI RIVER SYSTEM--II. AQUATIC FAUNA IN THE TOKACHI RIVER SYSTEM DURING MONTHS OF MARCH TO JULY IN 1977.] Sci. Rep. Hokkaido Salmon Hatchery No. 33. p. 31-45. Mar. 1979. In Japanese with English summ. SFA 24(4)
[Kesennuma Miyagi Pref. Fish. Exp. Stn., Japan]

79-002869 Kitchell, J. F.; Stein, R. A.; Knezevic, B. UTILIZATION OF FILAMENTOUS ALGAE BY FISHES IN SKADAR LAKE, YUGOSLAVIA. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2159-2165. 1978. SFA 24(4)
[Lab. Limnol., Univ. Wis., Madison 53706]

79-002870 Laurence, G. C.; Halavik, T. A.; Burns, B. R.; Smigielski, A. S. AN ENVIRONMENTAL CHAMBER FOR MONITORING "IN SITU" GROWTH AND SURVIVAL OF LARVAL FISHES. Trans. Am. Fish. Soc. 108 (2): 197-203. Mar. 1979. SFA 24(4)
[NMFS, Narragansett Lab., Narragansett, RI 02882]

79-002871 MacCrimmon, H. R.; Pugsley, R. W. FOOD AND FEEDING OF THE RAINBOW SMELT (/OSMERUS MORDAX/) IN LAKE SIMCOE, ONTARIO. Can. Field-Nat. 93 (3): 266-271. July-Sept. 1979. SFA 24(4)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Feeding by adult Rainbow Smelt (/Osmerus mordax/) is selective and varies with fish size, sex, and season. Intensity of feeding is lowered prior to spawning. Zooplankton is the major food, and we found no evidence of predation on the eggs or young of sport fishes. Fish were found in the stomachs of 11 percent of the females and 4.3 percent of the males and were mainly young-of-the-year smelt in summer and lake Emerald Shiners (/Notropis atherinoides/) in winter and spring. Fish were eaten only by smelt of age groups I to V (156 to 204 mm in fork length) while crustaceans were the principal food of young-of-the-year smelt.

79-002872 Mahan, A.; Suparno, T.; Carlander, K. D. FOOD HABITS OF WALKING-CATFISH (/CLARIAS BATRACHUS/) AND SNAKEHEAD (/OPHIOCEPHALUS STRIATUS/) IN RAWA PENING. J. Satya Wacana Res. 1 (4): 374-380. 1978. SFA 24(4)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50010] Stomach contents of 20 /Clarias/ and 32 /Ophiocephalus/ collected in June and July 1978 indicated both fed on shrimp (/Macrobrachium/ sp.) and insects, with shrimp most important to /Ophiocephalus/ and insects to /Clarias/. No difference in food of /Clarias/ from 22 to 377 g, or /Ophiocephalus/ 0.5-367 g was evident. One female /Clarias/ had about 1800 ova and 2 males had enlarged testes, but no /Ophiocephalus/ showed breeding condition in this period.

79-002873 McDonnell, J.; Tjokroprawiro, S.; Carlander, K. D. FOOD HABITS AND GONAD DEVELOPMENT OF CLIMBING PERCH (/ANABAS TESTUDINEUS/) IN RAWA PENING. J. Satya Wacana Res. 1 (4): 405-410. 1978. SFA 24(4)
Invertebrates and fish were found in 76 percent of the 37 /Anabas testudineus/ collected in May to July, 1978, and constituted over 66 percent of the volume of the stomach contents. Shrimp (/Macrobrachium/) were the most important. Many algae were identified but comprised only a small percentage of volume. 3 females had 13,000 to 18,000 ova, but most were not in breeding condition.

79-002874 McGee, M. V.; Griffith, J. S.; McLean, R. B. PREY SELECTION BY SAUGER IN WATTS BAR RESERVOIR, TENNESSEE, AS AFFECTED BY COLD-INDUCED MORTALITY OF THREADFIN SHAD. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 404-411. 1977[1979]. SFA 24(4)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830] Prey selection by sauger (/Stizostedion canadense/) was monitored from November 1976 through April 1977 in the portion of Watts Bar Reservoir, Tennessee, near the Kingston Steam Plant. Threadfin shad (/Dorosoma petenense/) provided the entire forage base for sauger until the population of threadfin was almost completely eliminated by low temperatures in December and January. Some sauger switched to alternate prey, but food consumption was greatly reduced in February-March as greater than 75 percent of stomachs were empty. Food consumption of sauger smaller than 30 cm was restricted earlier in the year by the lack of threadfin less than 8.0 cm. Digestive rate studies in the laboratory indicated digestion continued at a reduced, but effective, rate at temperature less than 10 C.

79-002875 Mittelbach, G. G. FORAGING EFFICIENCIES AND SIZE CLASS COMPETITION IN THE BLUEGILL SUNFISH (/LEPOMIS MACROCHIRUS/). Bull. Ecol. Soc. Am. 60 (2): 112. June 1979. Abstract only. SFA 24(4)
[W. K. Kellogg Biol. Stn., Mich. State Univ., Hickory Corners] The relationships between body size and foraging efficiency for bluegills feeding in different habitat types and on different foods were quantified from laboratory experiments. These measures of relative foraging abilities, coupled with habitat-specific prey availabilities, are used to explore size class interactions. Of particular interest are 1) the optimal body size for bluegills in a given habitat (or conversely, optimal habitat for a given body size), and 2) the magnitude of competitive asymmetries between different sized bluegills occupying the same habitat. Predictions of habitat use based upon maximizing energetic return are compared to field observations of habitat segregation by bluegill size classes. Systematic deviations from these predictions implicate the relative importance of other selection pressures (e.g., predation) which operate on the different

79-002875 CONTINUED
size classes.

79-002876 Moershel, P. FOOD HABITS AND GONAD DEVELOPMENT OF SEPAT ROWO (/TRICHOGASTER TRICHOPTERUS/) AND SEPAT SIAM (/T. PECTORALIS/) IN RAWA PENING. J. Satya Wacana Res. 1 (4): 398-404. 1978. SFA 24(4)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50010] These species in a central Java lake feed mostly on phytoplankton (52 percent of volume in sepat siam and 69 percent in sepat rowo) and zooplankton. 55 genera of phytoplankton were identified from the stomachs. None of the sepat siam were in spawning condition in June and July, but 3 female sepat rowo had 450 to 1250 ova in their gonads.

79-002877 Neilson, J. D.; Gillis, D. J. A NOTE ON THE STOMACH CONTENTS OF ADULT ATLANTIC SALMON (/SALMO SALAR/, LINNAEUS) FROM PORT BURWELL, NORTHWEST TERRITORIES. Can. J. Zool. 57 (7): 1502-1503. July 1979. In English with French summ. SFA 24(4)
[MacLaren Marex Inc., 1000 Windmill Rd., Dartmouth, NS B3B 1L7, Canada] Stomach content analyses on 28 Atlantic salmon captured at Port Burwell, Northwest Territories, in late August, 1977, indicate that invertebrate prey items were the most important by volume. /Parathemisto libellula/ dominated the invertebrate prey group, and /Ammodytes/ sp. was the most important fish in the diet of the salmon analyzed. A range extension for /Notoscopelus elongtus kroeyeri/ was recorded.

79-002878 Olatunde, A. A. THE FOOD AND FEEDING HABITS OF /PHYSAILIA PELLUCIDA/ AND /SCHILBE MYSTUS/ WITH NOTES ON THE DIETS OF /S. URANOSCOPUS/ AND /SILURANODON AURITUS/, FAMILY SCHILBEIDAE (OSTEICHTHYES: SILURIFORMES) IN LAKE KAINJI, NIGERIA. Freshwater Biol. 9 (3): 183-190. June 1979. SFA 24(4)
[Shagunu Field Stn., New Bussa, Nigeria] The food and feeding patterns of four schilbeids in Lake Kainji were studied between November 1974 and October 1975. /Physailia pellucida/, a small but abundant species, fed on small crustaceans and immature insects, while /Schilbe mystus/, a larger but less common schilbeid, fed principally on fish, with insects as a supplementary item in its diet. The rare species, /Schilbe uranoscopus/, was piscivorous. /Siluranodon auritus/, another small and rare species, is a herbivore feeding mainly on algae, with some crustaceans and immature insects taken as a source of animal protein. Preferential food selection by different length groups was found in /S. mystus/ and /P. pellucida/. There were seasonal changes in the dietary items. Competition for food within the family was assumed not to occur in view of the different feeding habits of the species.

79-002879 Olmsted, L. R.; Krater, S.; Williams, G. E.; Jaeger, R. G. FORAGING TACTICS OF THE MIMIC SHINER IN A TWO-PREY SYSTEM. Copeia 1979 (3): 437-441. 1 Aug. 1979. SFA 24(4)
[Dep. Biol. Sci., State Univ. N.Y., Albany 12222] The foraging behavior of the mimic shiner, /Notropis volucellus/, was studied experimentally when two prey types were presented in five different proportions. Results were tested against two theoretical models: the proportional feeding and the predator "switching" models. Neither model adequately predicted the feeding responses of the fish, although data fit the first model better. Large variations in prey preference were found, both within and between fish, when the two prey were repetitively offered in equal proportions. Such large variations prevent a precise calculation of the feeding preference factor (c) common to both models. Instead of exhibiting a precise preference

79-002879 CONTINUED
tactic based on prey availability, the fish appeared to temporally alter tactics, perhaps as a means of assessing changes in types and densities of prey present.

79-002880 Stein, R. A.; Gosse, C. K. SELECTIVE PREDATION BY REDEAR SUNFISH ON THREE SPECIES OF FRESHWATER SNAILS. Bull. Ecol. Soc. Am. 60 (2): 113. June 1979. Abstract only. SFA 24(4)
[Ohio State Univ., Columbus] Through laboratory experimentation, we determined vulnerability of three species of freshwater snails (/Physa integra/, /Helisoma anceps/, /Oxytrema semicarinata/) to predation by redear sunfish (/Lepomis microlophus/). Within any snail size class, redears preferred /Physa/ over /Helisoma/ over /Oxytrema/, just that order predicted by an empirically determined optimal foraging construct: handling time divided by snail dry weight (H(t)/dry wt). Similarly, order of increasing crushing resistance (estimated with a load cell coupled to a mechanical press) was /Physa/, /Helisoma/, /Oxytrema/, suggesting that vulnerability may be based on shell strength. However, within any one species, shell strength increased exponentially with snail size, yet the H(t)/dry wt construct predicted that largest animals should be chosen. In size selection experiments, redears exhibited little selectivity, suggesting that neither an energetic construct (operationally expressed as H(t)/dry wt) nor simple proximate factors (such as shell strength) govern selective consumption by these predators.

79-002881 Taylor, E. A. FOOD HABITS OF LARVAL /LEPOMIS/ SPP. IN OLD HICKORY RESERVOIR, TENNESSEE. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 432-436. 1977[1979]. SFA 24(4)
[Div. For. Fish. Wildl. Dev., TVA, Norris, TN 37828] In the Dixon Springs area of the Cumberland River, Tennessee, larval /Lepomis/ spp. began feeding upon crustacean zooplankton, especially /Bosmina longirostris/, when the fish attained lengths of 6.7 mm in 1975 and 8.8 mm in 1974. Cladocerans remained the dominant food item throughout the larval stage. The fish food selection diversified [to include other taxa.] larva reached approximately 11.5 mm. At greater lengths /Lepomis/ spp. larvae and postlarvae begin to rely more on chironomid larvae.

79-002882 Teguh, S. A. THE FOOD OF THE /OSTEOCHILUS HASSELTII/, NILEM, IN THE RAWA PENING LAKE. J. Satya Wacana Res. 1 (1): 24-32. 1978. SFA 24(4)
[Satya Wacana Christian Univ., Salatiga, Indonesia] Phytoplankton and periphyton constitute most of the food of this cyprinid fish. 41 genera of planktonic organisms were identified in the stomachs.

79-002883 Thorp, J. H.; Bergey, E. A. PREDATION AND BENTHIC COMMUNITY ORGANIZATION IN A THERMALLY DESTABILIZED RESERVOIR. Bull. Ecol. Soc. Am. 60 (2): 114. June 1979. Abstract only. SFA 24(4)
[Savannah River Ecol. Lab., Aiken, SC] We investigated the seasonal interaction of vertebrate predation and thermal stress on the abundance, relative trophic distribution, and species richness of the macroinvertebrate community. Thirty-six predator exclusion cages and 36 control plots were placed in shallow water at six locations along a thermal gradient in Par Lake on the Savannah River plant. Cages were in place during three 3-month test periods beginning in September 1977 and ending in August 1978. Before and after each 3-month period, two 15 cm diam. cores were removed from each plot giving 144 cores per sample date. Cages were open for one month between each test period. Emergence, temperature, and vegetation abundance data were collected

79-002883 CONTINUED
at regular intervals. Both species richness and numbers of individuals were affected by thermal regime (either stressed or enhanced) but fish predation had no detectable effect on benthic community organization.

79-002884 Tseytlin, V. B.; Gorelova, T. A. STUDY OF THE FEEDING OF THE LANTERNFISH /MYCTOPHUM NITIDULUM/ (MYCTOPHIDAE, PISCES). Oceanology 18 (4): 488-492. Feb. 1979. SFA 24(4)
[P. P. Shirshov Inst. Oceanol., USSR Acad. Sci., USSR] Quantitative data are presented on the feeding of 905 fry and adult /Myctophum nitidulum/ taken at the surface with a towed neuston trawl at various times of day. An elementary model of the feeding of the myctophids is examined and leads to a formula relating the stomach-filling index to the size of the daily ration and the time of digestion. For fry 11-20 cm long, the specific daily ration is 13 percent and the digestion time 2.3 hr. Calculation of the specific daily ration from the energy-balance equation gives similar values: 11-16 percent.

AGE AND GROWTH

79-002885 Bulow, F. J.; Heitman, J. F. TIME OF ANNULUS FORMATION OF BLUEGILLS IN THREE CENTRAL TENNESSEE LAKES. J. Tenn. Acad. Sci. 54 (3): 116-118. July 1979. SFA 24(4)
[Tenn. Technol. Univ., Cookeville 38501] Monthly samples of bluegills were collected from three central Tennessee lakes (approximate latitude 36°N) to determine time of onset of active feeding and growth as reflected by formation of the annulus for the current year. Annulus formation was shown to be closely temperature related with formation beginning earlier in warmer waters. Annulus formation began earlier, extended over a longer period of time, and was completed later in the smaller, shallower lakes. Date of 100 percent completion of annulus formation ranged from late April-early May in Center Hill Reservoir to late May-early June in Burgess Falls Lake.

79-002886 Carlander, K. D.; HadiKastowo SIZES OF FISH IN THE CATCH OF RAWA PENING, 1978. J. Satya Wacana Res. 1 (5): 505-525. 1979. SFA 24(4)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50010] Total lengths of fish were recorded with a special measuring board on which fish are placed on a plastic sheet and their lengths recorded with a nail punch on mm graph paper. Length frequencies of /Osteochilus hasselti/ at half-month intervals gave some indication of age groups and growth, but other species did not. All species, except /Trichogaster trichopterus/, averaged smaller in 1978 than in 1975. The size distributions in 1978 are very indicative of overexploitation.

79-002887 Carlander, K. D. WEIGHT-LENGTH RELATIONSHIPS OF SOME RAWA PENING FISHES. J. Satya Wacana Res. 1 (5): 493-504. 1979. SFA 24(4)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50010] The slopes (v) of the log weight-long length relationships of /Clarias batrachus/, /Monopterus albus/, /Puntius binotatus/, /Osteochilus hasselti/, and /Trichogaster pectoralis/ were significantly greater than 3.0. The slope of /T. trichopterus/ was significantly below, that of /Ophiocephalus striatus/ was 2.97 and that of /Anabas testudineus/ 3.097, not different from 3.0. The mean ponderal indexes (K) were /Monopterus/ 0.093, /Ophiocephalus/ 0.858, /Clarias/ 0.883, /Osteochilus/ 1.191, /Puntius/ 1.29, /T. pectoralis/ 1.46, /T.

79-002887 CONTINUED
trichogaster/ 1.525, and /Anabas/ 1.867. Tables of weights at various lengths were given for use in calculating yields from length measurements.

79-002888 DeAngelis, D. L.; Coutant, C. C. GROWTH RATES AND SIZE DISTRIBUTIONS OF FIRST-YEAR SMALLMOUTH BASS POPULATIONS: SOME CONCLUSIONS FROM EXPERIMENTS AND A MODEL. Trans. Am. Fish. Soc. 108 (2): 137-141. Mar. 1979. SFA 24(4)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830]

79-002889 Edwards, R. W.; Densem, J. W.; Russell, P. A. AN ASSESSMENT OF THE IMPORTANCE OF TEMPERATURE AS A FACTOR CONTROLLING THE GROWTH RATE OF BROWN TROUT IN STREAMS. J. Anim. Ecol. 48 (2): 501-507. June 1979. SFA 24(4)
[Dep. Appl. Biol., UWIST, King Edward VII Ave., Cardiff, U.K.] The maximum growth rates of brown trout have been computed from temperatures in rivers and streams of contrasting character and location, using the growth model of Elliott for trout on maximum ration. The high growth rates of trout in chalk streams may be largely explained by their ambient temperature regime, principally its relatively homothermous character. Comparisons of observed and computed maximum growth rates, for the few locations where contemporaneous temperature and growth data are available, suggest that growth rates are generally between 60 and 90 percent of the computed maximum for that temperature regime and that this percentage is no higher in chalk streams.

79-002890 Hein, S. H.; Shepard, J. A. SIZE DISPARITY BETWEEN "INSIDE" AND "OUTSIDE" SPOTTED SEATROUT (/CYNOSCION NEBULOSUS/) DURING A THREE-MONTH STUDY IN SOUTH-CENTRAL LOUISIANA. La. Wildl. Fish. Comm. Tech. Bull. No. 28. p. 16-28. May 1979. SFA 24(4)
[La. Dep. Wildl. Fish., Mar. Res. Lab., Grand Terre Island] This study was conducted at a commercial fish house in south-central Louisiana. The area fished by the commercial fishermen was divided into two zones: the inside zone, which consisted of a marsh-type environment with canals, bayous, small lakes, and bays; and the outside zone, which consisted of sandy bottom coastal areas, islands, and island chains. Fish were sampled weekly when possible for length, weight, and sex. A total of 240 fish were sampled during a three-month period. Average total length, weight, condition factors, and gonadosomatic indexes (GSI) were determined. Certain morphometric (total length, weight) and color differences were noted between fish from the two areas. Average size for females, without exception, were larger than males in both areas. "Outside" fish were larger than "inside" fish for two months out of three.

79-002891 Hoag, S. H.; Schmitt, C. C.; Hardman, W. H. SIZE, AGE, AND FREQUENCY OF MALE AND FEMALE HALIBUT: SETLINE RESEARCH CATCHES, 1925-1977. Int. Pac. Halibut Comm. Tech. Rep. No. 17. 112p. 1979. SFA 24(4)
[Int. Pac. Halibut Comm. P.O. Box 5009, University Station, Seattle, WA 98105] A lack of information on the sex of halibut in commercial landings has been a basic problem in assessing halibut stocks because growth and mortality of males and females are different. Considerable data on the size, age, and frequency of male and female halibut are available from research cruises. These data are summarized by experiment, region, and time-period. The results corroborate previously recognized differences in the size and age of halibut with respect to sex, area, and time, and provide a base for future studies.

79-002892 Kenyon, R. B. GROWTH CHANGES IN A POPULATION OF WHITEFISH IN LAKE ERIE. N.Y. Fish Game J. 25 (2): 129-139. July 1978. SFA 24(4)

Experimental data collected from whitefish in the Pennsylvania waters of Lake Erie from 1971 to 1974 were used to describe the population since its drastic decline after the late 1940's. Growth was calculated and compared with that of the whitefish population of the late 1920's when the stocks were considered abundant. Several body-scale functions were tested for best fit, and the functional geometric mean regression permitted the closest fit to empirical data for mean length. Calculated growth curves for both periods were transformed to Walford regression lines, and the indicated lower rate of growth in recent years was deemed significant. A significant increase in weight per unit of length between the two periods was indicated by length-weight regressions (log transformations). Probable explanations for these changes are discussed, focusing primarily on climatology, the trophic state of Lake Erie and the zoogeography and abundance of whitefish.

79-002893 Landau, R. RACES OF /SARDINELLA AURITA/, THEIR GROWTH PATTERNS AND THEIR IMPORTANCE IN STOCK ASSESSMENT. Proc. Sci. Conf. Isr. Ecol. Soc. 4: e41-e70. 1973. SFA 24(4)

[Isr. Oceanogr. Limnol. Res. Ltd., Haifa, Israel]

79-002894 Medvick, P. A. GROWTH RATES OF JUVENILE MAOMAO, /ABUDEFDUF ABDOMINALIS/, AT CONSTANT AND CYCLIC TEMPERATURES. Trans. Am. Fish. Soc. 108 (3): 293-298. May 1979. SFA 24(4)

[Dep. Biol., Mont. State Univ., Bozeman 59717]

79-002895 Meunier, F. J.; Pascal, M.; Loubens, G. COMPARAISON DE METHODES SQUELETTOCHRONOLOGIQUES ET CONSIDERATIONS FONCTIONELLES SUR LE TISSU OSSEUX ACELLUIAIRE D'UN OSTEICHTHYEN DU IAGON NEO-CALEDONIEN, /LETHRINUS NEBULOSUS/ (FORSKAL, 1775). [COMPARISON OF SKELETO-CHRONOLOGICAL METHODS AND FUNCTIONAL CONSIDERATIONS ON AN ACELLULAR BONY TISSUE OF AN OSTEICHTHIAN, /LETHRINUS NEBULOSUS/ (FORSKAL, 1775) FROM THE NEO-CALEDONIAN LAGOON.] Aquaculture 17 (2): 137-157. June 1979. In French with English summ. SFA 24(4)

[Lab. Anat. Comp., Univ. Paris 7, 2 Place Jussieu, 75221 Paris Cedex 05, France] A comparison of several methods of individual ageing on a sample of 45 fishes (/Lethrinus nebulosus/) from the Neo-Caledonian lagoon shows that the results given by counting the hematoxylin positive 'resting lines' (here called L.A.C.) of the dorsal fin spines agree well with those of otolithic counting. However, bone histology is useful after a critical study of the biological significance of the different types of hematoxylinophilous lines; some of them have indeed an annual value (L.A.C.), others probably relate to important events which happen during the first year of life. Various patterns of cyclical growth recording in bone among osteichthians are compared, and their functional significance relative to external and internal factors is briefly discussed.

79-002896 Page, L. M.; Burr, B. M. THE SMALLEST SPECIES OF DARTER (PISCES: PERCIDAE). Am. Midl. Nat. 101 (2): 452-453. Apr. 1979. SFA 24(4)

[Ill. Nat. Hist. Surv., Urbana 61801] The smallest species of darter among the 148 recognized species is determined by weight-length relationship to be /Etheostoma fonticola/, a species reaching a maximum standard length of only 35.5 mm.

79-002897 Penczak, T.; Lorenc, E.; Lorenc, J.; Zdzinnicka, M. THE ECOLOGY OF ROACH, /RUTILUS RUTILUS/ (L.), IN THE BARBEL REGION OF THE POLLUTED PILICA RIVER. V. ESTIMATION OF THE AGE AND GROWTH ACCORDING TO THE OPERCULAR BONES. Ekol. Pol. 27 (1): 135-154. 1979. SFA 24(4)

[Dep. Comp. Anat., Inst. Environ. Biol., Univ. Lodz, Banocha 12/16, 90-237 Lodz, Poland]

79-002898 Perry, W. G.; Carver, D. C. LENGTH AT MATURITY, TOTAL-COLLARBONE LENGTH, AND DRESSOUT FOR FLATHEAD CATFISH AND LENGTH AT MATURITY OF BLUE CATFISH, SOUTHWEST LOUISIANA. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 529-537. 1977[1979]. SFA 24(4)

[La. Dep. Wildl. Fish., Grand Chenier 70643] Length at maturity computed for female flathead catfish (/Pylcdictus olivaris/) from marshes of southwest Louisiana was 589 mm. Empirical data showed males approach maturity in the 390-439 mm size range. The length-weight regression for flathead catfish was best described by: Log W = -8.9640 + 3.3732 Log L, where W = weight in kg and L = length in mm, r = 0.97. The computed total length-collarbone length conversion equation for flathead catfish was Y = 10.3428 + 0.7251, where Y = total collarbone length in mm and X = total body length in mm, r = 0.99. Dressout-live weight relationship for flathead catfish was Y = 0.3308 + 0.7123 X, where Y = cleaned (headed and eviscerated) weight in kg and X = live weight in kg, r = 0.70. Computed length at maturity for blue catfish (/Ictalurus furcatus/) was 481 mm.

79-002899 Shelton, W. L.; Davies, W. D.; King, T. A.; Timmons, T. J. VARIATION IN THE GROWTH OF THE INITIAL YEAR CLASS OF LARGEMOUTH BASS IN WEST POINT RESERVOIR, ALABAMA AND GEORGIA. Trans. Am. Fish. Soc. 108 (2): 142-149. Mar. 1979. SFA 24(4)

[Ala. Coop. Fish. Res. Unit., Auburn Univ., Auburn, AL 36830]

79-002900 Timmons, T. J. EARLY GROWTH AND MORTALITY OF LARGEMOUTH BASS, /MICROPTERUS SALMOIDES/ (LACEPEDE), IN RELATION TO AN EXTENDED SPAWNING SEASON AND PREY AVAILABILITY IN WEST POINT RESERVOIR. Ph.D. dissertation, Auburn Univ. 108p. 1979. From Diss. Abstr. Int. B Sci. Eng. 39(12, part 1):5720. June 1979. SFA 24(4)

First year growth of each year class of largemouth bass, /Micropterus salmoides/, at West Point Reservoir has been highly variable since impoundment in 1975. Each year class was represented in the fall by a slow-growing and a large fast-growing fish. The prolonged spawning period resulted in a wide range in the sizes of bass but inadequate fish prey for small bass after June was instrumental in creating the growth disparity. Estimates of rates of growth and mortality were made for the 1977 year class of largemouth bass. The population fecundity was estimated before spawning as 422,000 mature ova/ha in littoral areas. Estimates of the number of young-of-the-year ranged from maximum of 1138 bass/ha in May to a minimum of 20 bass/ha by late August. Survival from 5 June to 4 September was 5.9 percent. The daily instantaneous growth rate was 0.027 between May and September 1977. The biomass of the 1977 year class was 4.4 kg/ha in

79-002900a CONTINUED
September,--From abstr.

79-002901 Wakeman, J. M.; Arnold, C. R.; Wohlschlag, D. E.; Rabalais, S. C. OXYGEN CONSUMPTION, ENERGY EXPENDITURE, AND GROWTH OF THE RED SNAPPER (/LUTJANUS CAMPECHANUS/). Trans. Am. Fish. Soc. 108 (3): 288-292. May 1979. SFA 24(4)
[Dep. Zool., La. Tech. Univ., Ruston 71272]

79-002902 Webb, B. F.; Grant, C. J. AGE AND GROWTH OF JACK MACKEREL, /TRACHURUS DECLIVIS/ (JENYNS), FROM SOUTH-EASTERN AUSTRALIAN WATERS. Aust. J. Mar. Freshwater Res. 30 (1): 1-9. Feb. 1979. SFA 24(4)
[North Canterbury Acclimatisation Soc., 61 Bealey Ave., Christchurch 1, New Zealand] Jack mackerel data were collected between October 1973 and February 1976 from south-eastern Australian waters. Otoliths were read using reflected light on (1) the surface of the whole otolith and (2) the broken and burnt transverse sections of the same otolith. Growth rings were read to 13 years in the first method and to 16 years in the second. Otolith radius (R, nucleus to posterior margin) measured along the concave surface was related to fish length (L) in a curvilinear form: $R = 2.39 L^{0.6635}$. Otolith intermediate radii (r(n)) plotted against fish length for ages 1 to 10 years indicated a regular deposition of growth rings. Growth according to the von Bertalanffy equation was slow (L [infinity] = 46.3, K = 0.23). No significant difference between the mean lengths was apparent between sexes at most ages. The geometric mean regressions of length on weight indicated differences between fish in spawning and non-spawning condition.

79-002903 Zigman, S.; Yulo, T. EYE LENS AGEING IN THE DOGFISH (/MUSTELUS CANIS/). Comp. Biochem. Physiol. B Comp. Biochem. 63 (3): 379-385. 1979. SFA 24(4)
[Dep. Ophthalmol., Univ. Rochester Sch. Med. Dent., 601 Elmwood Ave. (Box 314), Rochester, NY 14642] Age-related alterations in the distribution of water-soluble, high molecular weight (colloidal), and water-insoluble proteins of the lens of smooth dogfish (/Mustelus canis/) were measured. The ages of these animals ranged approx from 2 to 50 yr, during which time the lenses grew from 100 to 1500 mg (wet wt). The lenses contained approx 50 percent water. Water-insoluble protein accumulated to a level greater than 50 percent of the total proteins by the time the animals reached maturity. The lenses of other animals, such as mammals and humans, would be opaque if they had a similar insoluble protein content. Each protein fraction contained the same protein chains (mol. et 1900-25,000 daltons), as observed by SDS polyacrylamide gel electrophoresis, except the water-insoluble fraction, which seemed to contain several extra protein chains with higher molecular weights, which represent fiber cell membrane components. Further purification of these fiber cell memnbranes indicated that their protein chain makeup was mainly from the same low molecular weight chains present in the soluble and high molecular weight colloidal proteins.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

79-002904 Behrstock, R. A. A JUVENILE OCEAN TRIGGERFISH, /CANTHIDERMIS MACULATUS/ (BLOCH), (PISCES, BALISTIDAE) FROM THE GULF OF CALIFORNIA. Calif. Fish Game 65 (3): 169-170. July 1979. SFA 24(4)
[Dep. Fish., Sch. Nat. Resour., Humboldt State Univ., Arcata, CA 95521]

79-002905 Ben-Tuvia, A. REVISED LIST OF THE MEDITERRANEAN FISHES OF ISRAEL. Isr. J. Zool. 20: 1-39. 1971. SFA 24(4)
A total of 284 species have been identified from the region of the Mediterranean coast of Israel: 198 (69.7 percent) are Atlanto-Mediterranean; 39 (13.7 percent) are cosmopolitan or circumtropical; 30 (10.6 percent) are known to be of Red Sea origin, but include three species which are also cosmopolitan. Twenty species (7.0 percent) are known from the Mediterranean Sea only. Eighty-five species are recorded that were not in an earlier list of fishes from the coast of Israel and many of these are new records for the eastern Mediterranean. Recent taxonomic revisions and changes in nomenclature have been taken into consideration. The high sea-temperatures of the eastern Mediterranean are probably the limiting factor in the distribution of many boreal and deep-water fishes known from the western Mediterranean. Chimaeridae, Acipenseridae, Berycidae, Luvaridae, Scophthalmidae and Pleuronectidae are not represented in collections from this coast. Gadidae and Moridae are represented only by few and rarely encountered species.

79-002906 Brittan, M. R.; Grossman, G. D. A PACU (COLOSSOMA, FAMILY CHARACIDAE) CAUGHT IN THE SACRAMENTO RIVER. Calif. Fish Game 65 (3): 170-173. July 1979. SFA 24(4)
[Calif. State Univ., Sacramento 95819]

79-002907 Clark, E.; Ben-Tuvia, A. RED SEA FISHES OF THE FAMILY BRANCHIOSTEGIDAE WITH A DESCRIPTION OF A NEW GENUS AND SPECIES /ASYMMETRURUS ORENI/. Sea Fish. Res. Stn. (Haifa) Bull. 60: 63-74. 1974. SFA 24(4)

79-002908 Cooley, N. R. AN INVENTORY OF THE ESTUARINE FAUNA IN THE VICINITY OF PENSACOLA, FLORIDA. Fla. Dep. Nat. Resour. Mar. Res. Lab. Publ. No. 31. 119p. Dec. 1978. SFA 24(4)
[Fla. Dep. Nat. Resour., 100 8th Ave. SE, St. Petersburg 33701]

79-002909 Dalen, J.; Smedstad, O. M. BUNNFISKUNDERSOKELSER I BARENTSHAVET VINTEREN 1978. [INVESTIGATIONS ON DEMERSAL FISH IN THE BARENTS SEA IN WINTER 1978.] Fisken Havet 1979 (2): 1-13. 1979. In Norwegian with English summ. SFA 24(4)
[Fiskeridir. Havforskninginst., Bergen, Norway]

79-002910 Deacon, J. E. FISHES OF NORTH AMERICA ENDANGERED, THREATENED, OR OF SPECIAL CONCERN: 1979. Fisheries (Bull. Am. Fish. Soc.) 4 (2): 29-44. Mar.-Apr. 1979. SFA 24(4)
[Dep. Biol. Sci., Univ. Nev., Las Vegas 89154]

79-002911 Dooley, J. K. A RARE AND UNUSUALLY LARGE MACRCURID FISH FROM THE CANARY ISLANDS. Copeia 1979 (3): 541-542. 1 Aug. 1979. SFA 24(4)
[Dep. Biol., Adelphi Univ., Garden City, NY 11530]

79-002912 Ecology Consultants, Inc. CAPTURE LOCATIONS OF RARE FISH IN THE UPPER COLORADO RIVER SYSTEM. U.S. Fish Wildl. Serv. FWS/OBS-78/32. v + 44p. Dec. 1978. SFA 24(4)
[P.O. Box 2105, Fort Collins, CO 80522]

79-002913 Evans, J. W.; Noble, R. L. THE LONGITUDINAL DISTRIBUTION OF FISHES IN AN EAST TEXAS STREAM. Am. Midl. Nat. 101 (2): 333-343. Apr. 1979. SFA 24(4)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ. College Station 77843]

79-002914 Fitch, J. E. THE VELVET WHALEFISH, /BARBOURISIA RUFA/, ADDED TO CALIFORNIA'S MARINE FAUNA, WITH NOTES ON OTOLITHS OF WHALEFISHES AND POSSIBLE RELATED GENERA. Bull. South. Calif. Acad. Sci. 78 (1): 61-67. Apr. 1979. SFA 24(4)
[Calif. Dep. Fish Game, Long Beach 90802]

79-002915 Goettl, J. P., Jr.; Edde, J. W. ENVIRONMENTAL EFFECTS OF OIL SHALE MINING AND PROCESSING. PART I--FISHES OF PICEANCE CREEK, COLORADO, PRIOR TO OIL SHALE PROCESSING. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-096. viii + 19p. Oct. 1978. SFA 24(4)
[Colo. Div. Wildl., Fish. Res. Cent., Fort Collins 80522]

79-002916 Grace, R. V.; Grace, A. B. MARINE NOTES ON HEN ISLAND, NORTH-EASTERN NEW ZEALAND. Tane 24: 131-135. 1978. SFA 24(4)
[274a Birkdale Rd., Birkenhead, Auckland 10, New Zealand]

79-002917 Haaker, P. L. TWO ASIATIC GOBIID FISHES, /TRIDENTIGER TRIGONOCEPHALUS/ AND /ACANTHOGOBIUS FLAVIMANUS/, IN SOUTHERN CALIFORNIA. Bull. South. Calif. Acad. Sci. 78 (1): 56-61. Apr. 1979. SFA 24(4)
[Calif. Dep. Fish Game, 350 Golden Shore, Long Beach 90802]

79-002918 Hubbs, C. L.; Follett, W. I.; Dempster, L. J. LIST OF THE FISHES OF CALIFORNIA. Calif. Acad. Sci. Occas. Pap. No. 133. 51p. 12 June 1979. SFA 24(4)
[Scripps Inst. Oceanogr., La Jolla 92093]

79-002919 Jankovic, D. EFFECTS OF ANTHROPOGENIC FACTORS ON THE ZONAL DISTRIBUTION OF FISHES IN THE DANUBE RIVER SYSTEM IN SERBIA (YUGOSLAVIA). Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2150-2153. 1978. SFA 24(4)
[Inst. Biol. Res., St. 29 Novembra No. 142, YU-11000 Belgrade, Yugoslavia]

79-002920 Knezevic, B.; Kazic, D.; Nedic, D.; Kavaric, M.; Ivanovic, B. UNIQUE CHARACTERISTICS OF ICHTHYOFAUNA AND ICHTHYOPARASITES OF SKADAR LAKE. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2166-2171. 1978. SFA 24(4)
[Biol. Inst., YU-81000 Titograd, Yugoslavia]

79-002921 Kullander, S. O. SPECIES OF /APISTOGRAMMA/ (TELEOSTEI, CICHLIDAE) FROM THE ORINOCO DRAINAGE BASIN, SOUTH AMERICA, WITH DESCRIPTIONS OF FOUR NEW SPECIES. Zool. Scr. 8 (1): 69-79. 1979. SFA 24(4)
[Dep. Biol., Umea Univ., Umea, Sweden]

79-002922 Lema, T. de PRESENCA DE /EQUETUS LANCEOLATUS/ (L. 1758) NA COSTA MARINHA DO ESTADO DO RIO GRANDE DO SUL (TELEOSTEI: PERCIFORMES: SCIAENIDAE). [THE PRESENCE OF /EQUETUS LANCEOLATUS/ IN THE COASTAL MARINE WATERS OF RIO GRANDE DO SUL STATE, BRAZIL (TELEOSTEI: PERCIFORMES: SCIAENIDAE).] Iheringia Ser. Zool. No. 54. p. 17-19. 20 Jan. 1979. In Portuguese with English summ. SFA 24(4)
[Mus. Ciencias Nat., Caixa Postal 1188, 90.000 Porto Alegre, RS, Brazil]

79-002923 Malick, R. W., Jr. THE MIMIC SHINER, /NOTROPIS VOLUCELLUS/ (COPE), IN THE SUSQUEHANNA RIVER DRAINAGE OF PENNSYLVANIA. Proc. Pa. Acad. Sci. 52 (2): 199-200. 1978. SFA 24(4)
[Ichthyological Assoc., Inc., Three Mile Island Aquatic Study, P.O. Box 223, Etters, PA 17319] The mimic shiner, /Notropis volucellus/ (Cope), is recorded for the first time from the Susquehanna River Drainage in Pennsylvania. Specimens were collected from Sherman Creek in Perry County, and from Lake Frederic, a mainstream Susquehanna impoundment, in Dauphin County.

79-002924 Martosudarmo, B.; Noor-Hamid, S.; Sabaruddin, S. OCCURRENCE OF MILKFISH, /CHANOS CHANOS/, SPAWNERS IN KARIMUN JAWA WATERS. Bull. Shrimp Cult. Res. Cent. (Jepara) 2 (1-2): 169-176. Jan.-July 1976. SFA 24(4)
[Shrimp Cult. Res. Cent., Jepara, Indonesia] Observation of adult milkfish in Karimun Jawa off the north coast of Central Java, Indonesia, over a period of more than two years, using gill net as fishing gear and obtaining 49 specimens of milkfish in various sizes is described. It was revealed that most of the milkfish were captured between midnight to early morning in sandy and coralline bottom of 2-10 m in depth. Physiological stress seems to be a major factor causing mortality of the fish after removal from the net.

79-002925 McDonough, T. A.; Barr, W. C. AN ANALYSIS OF FISH ASSOCIATIONS IN TENNESSEE AND CUMBERLAND DRAINAGE IMPOUNDMENTS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 555-563. 1977[1979]. SFA 24(4)
[Div. For. Fish. Wildl. Dev., TVA, Norris, TN 37828] Distribution of fish in the heavily impounded Tennessee and Cumberland River systems shows definite longitudinal zonation similar to that in nonimpounded river systems. Ten of 11 physical variables examined were highly correlated with one another, reflecting the complex of conditions accompanying changes from storage reservoirs in upper elevations to mainstream reservoirs in the lowlands. Elevation was the variable most highly correlated with the number of species. Cluster analysis indicated 4 associations of reservoirs: lower mainstream, upper mainstream and large storage, upper Holston, and Blue Ridge.

79-002926 Mills, P. A., Jr.; Hocutt, C. H.; Stauffer, J. R., Jr. THE PRE-IMPOUNDMENT FISH FAUNA OF BIG RIVER (MERAMEC DRAINAGE, MISSOURI). Trans. Mo. Acad. Sci. 12: 25-35. 1978. SFA 24(4)
[Mus. Nat. Hist., Univ. Kans., Lawrence 66045] Eighty-two species of fishes were collected from 37 localities on Big River (principal tributary of the Meramec River, East-central Missouri) from 1974-1976. Of these, 14 were newly reported from the system, and 5 others had not been collected since before 1945. The fauna is essentially "Ozarkian" and is divided into those species which are primarily headwaters and tributary inhabitants, those generally restricted to the lower river, and those widely distributed. In conjunction with literature records, we document the presence of 90 species of fishes in Big River and discuss some possible effects of the two proposed impoundments on the composition and distribution of the fauna.

79-002927 Minter, K. W.; Green, R.; Pallo, S.; McGinness, T. FISH DISTRIBUTION IN NORTHWEST MISSOURI. Trans. Mo. Acad. Sci. 12: 167. 1978. Abstract only. SFA 24(4)
[Northwest Mo. State Univ., Maryville 64468] A study of fish distribution in Atchinson, Nodaway, and Gentry Counties in Northwest Missouri. Thirty-three, 42, and 36 species were collected in each county from 1968 to 1974, respectively. A total of 48 species are known to have occurred in Nodaway County.

79-002928 Nakaya, K.; Bass, A. J. THE FRILL SHARK /CHLAMYDOSELACHUS ANGUINEUS/ IN NEW ZEALAND SEAS. N.Z. J. Mar. Freshwater Res. 12 (4): 397-398. Dec. 1978. SFA 24(4)
[Lab. Mar. Zool., Hokkaido Univ., Hakodate, Hokkaido 041, Japan] Six specimens were caught in 602-802 m of water off the South Island between August 1975 and October 1977: three males of 730-1340 mm total length, and three females of 1350-1575 mm. These are the first records of the species for New Zealand.

79-002929 Perschbacher, P. W.; Sulak, K. J.; Schwartz, F. J. INVASION OF THE ATLANTIC BY /PEPRILUS BURTI/ (PISCES: STROMATEIDAE) AND POSSIBLE IMPLICATIONS. Copeia 1979 (3): 538-541. 1 Aug. 1979. SFA 24(4)
[Univ. N.C., Inst. Mar. Sci., P.O. Box 809, Morehead City 28557]

79-002930 Roberts, P. E.; Paul, L. J. SEASONAL HYDROLOGICAL CHANGES IN CONTINENTAL SHELF WATERS OFF THE WEST COAST, NORTH ISLAND, NEW ZEALAND, AND COMMENTS ON FISH DISTRIBUTIONS. N.Z. Mar. Freshwater Res. 12 (4): 323-339. Dec. 1978. SFA 24(4)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19062, Wellington, New Zealand]

79-002931 Robertson, D. A.; Roberts, P. E.; Wilson, J. B. MESOPELAGIC FAUNAL TRANSITION ACROSS THE SUBTROPICAL CONVERGENCE EAST OF NEW ZEALAND. N.Z. Mar. Freshwater Res. 12 (4): 295-312. Dec. 1978. SFA 24(4)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 19062, Wellington, New Zealand] The winter distributions of mesopelagic fishes, crustaceans, and cephalopods across the Subtropical Convergence east of New Zealand are shown to reflect the hydrological changes associated with convergence of Subtropical and Subantarctic Surface Waters. Samples collected in the upper 400 m in each of these water masses and in mixed water over the Chatham Rise contained members of faunal associations apparently characteristic for each area. The area of strongest hydrological change was characterised, at least for fishes and crustaceans, by a considerable decrease in species richness. Use of cluster analysis confirmed the clear correspondence between geographic species associations and water masses.

79-002932 Skreslet, S. THE FISH FAUNA OF SKJOMEN, A FJORD OF NORTH NORWAY. Astarte 11 (2): 67-77. 1978. SFA 24(4)
[Fish. Div., Nordland Reg. Coll., P.O. Box 309, N-8001 Bodo, Norway]

79-002933 Steinitz, H.; Ben-Tuvia, A. FISHES OF THE SUEZ CANAL. Isr. J. Zool. 21: 385-389. 1972. SFA 24(4)

79-002934 Strebkova, T.; Dergaleva, Zh. [ACCLIMATIZATION OF THE STRIPED PERCH IN THE USSR.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 4: 47-52. 1975[1977]. In Russian. SFA 24(4)
[VNIRO, 17 Krasnoselskaya, Moscow B-140, USSR]

79-002935 Tabita, O.; Nonaka, S.; Sakurai, N. [OCCURRENCE OF ELVERS OF THE EUROPEAN EEL, /ANGUILLA ANGUILLA/ LINNAEUS IN SHIZUOKA AND KANAGAWA PREFECTURES, JAPAN, IN 1977.] Bull. Jpn. Soc. Sci. Fish. 45 (4): 437-441. Apr. 1979. In Japanese with English summ. SFA 24(4)
[Dep. Aquacult. Biol., Shimonoseki Univ. Fish., Shimonoseki, 759-65, Japan]

79-002936 Takahashi, T.; Kohno, S. STUDIES ON THE ECOLOGY OF THE HERRING IN THE NORTHERN PART OF THE OKHOTSK SEA IN SUMMER--IV. ON THE PURSUIT OF "AYAN GROUP" USING SCALE PATTERN. Bull. Jpn. Soc. Sci. Fish. 45 (6): 677-686. June 1979. SFA 24(4)
[Fac. Fish., Hokkaido Univ., Minato-cho, Hakodate 041, Japan]

79-002937 Walker, M. H. AN INVENTORY OF THE MARINE RESOURCES OF THE BUNBURY MARINE AREA AND GEOGRAPHE BAY. West. Aust. Dep. Fish. Wildl. Rep. No. 37. 46p. 1979. SFA 24(4)
[West. Aust. Mar. Res. Lab., P.O. Box 20, North Beach, West. Aust., 6020, Australia]

79-002938 Wenner, C. A.; Barans, C. A.; Stender, B. W.; Berry, F. H. RESULTS OF MARMAP OTTER TRAWL INVESTIGATIONS IN THE SOUTH ATLANTIC BIGHT. I. FALL 1973. S. C. Mar. Resour. Cent. Tech. Rep. No. 33. 79p. Mar. 1979. SFA 24(4)
[Mar. Resour. Res. Inst., S.C. Wildl. Mar. Resour. Dep., Charleston 29412]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

79-002939 Dahlberg, M. D. A REVIEW OF SURVIVAL RATES OF FISH EGGS AND LARVAE IN RELATION TO IMPACT ASSESSMENTS. Mar. Fish. Rev. 41 (3): 1-12. Mar. 1979. SFA 24(4)
[NUS Corp., 1910 Cochran Rd., Pittsburgh, PA 15220]

79-002940 Eldon, G. A.; Howden, P. J.; Howden, D. B. REDUCTION OF A POPULATION OF CANTERBURY MUDFISH, /NEOCHANNA BURROWSIUS/ (GALAXIIDAE), BY DROUGHT. N.Z. Mar. Freshwater Res. 12 (4): 313-321. Dec. 1978. SFA 24(4)
[Fish. Res. Div., Minist. Agric. Fish., Christchurch, New Zealand] A population of Canterbury mudfish /Neochanna burrowsius/ (Phillipps), estimated to exceed 3000 adults in July-December 1975, and its habitat at Clearwell in mid Canterbury, are described. A 7 month drought nearly extinguished the population; this and the subsequent return migration (in August 1976) of survivors from a stockwater race are recorded.

79-002941 Guillory, V. A GRAPHICAL METHOD TO ASSESS FAUNAL DOMINANCE. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 563-564. 1977[1979]. SFA 24(4)
[Fla. Game Fresh Water Fish Comm. P.O. Box 1903, Eustis 32726] A graphical method of illustrating dominance in fish communities is presented. This procedure incorporates both numeric abundance and frequency of occurrence data and illustrates the relative dominance of each species.

79-002942 Hughes, R. M. TEMPERATURE, INTERSPECIFIC COMPETITION, AND THE PRODUCTION OF JUVENILE SALMONIDS IN EXPERIMENTAL STREAM COMMUNITIES. Ph.D. dissertation, Oreg. State Univ. 104p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(2):573. Aug. 1979. SFA 24(4)

79-002943 King, T. A.; Davies, W. D.; Shelton, W. L. FISHING AND NATURAL MORTALITY: EFFECTS ON THE INITIAL YEAR CLASS OF LARGEMOUTH BASS IN WEST POINT RESERVOIR, ALABAMA-GEORGIA. Trans. Am. Fish. Soc. 108 (2): 150-155. Mar. 1979. SFA 24(4)
[Ala. Coop. Fish. Res. Unit, Auburn Univ., Auburn, AL 36830]

79-002944 Oliver, J. D.; Holeton, G. F.; Chua, K. E. OVERWINTER MORTALITY OF FINGERLING SMALLMOUTH BASS IN RELATION TO SIZE, RELATIVE ENERGY STORES, AND ENVIRONMENTAL TEMPERATURE. Trans. Am. Fish. Soc. 108 (2): 130-136. Mar. 1979. SFA 24(4)
[Dep. Zool., Univ. Ga., Athens 30602]

79-002945 Platts, W. S. RELATIONSHIPS AMONG STREAM ORDER, FISH POPULATIONS, AND AQUATIC GEOMORPHOLOGY IN AN IDAHO RIVER DRAINAGE. Fisheries (Bull. Am. Fish. Soc.) 4 (2): 5-9. Mar.-Apr. 1979. SFA 24(4)
[U.S. For. Serv., For. Range Exp. Stn., 316 E. Myrtle St., Boise, ID 83706] As stream order (1-5) increased, width and depth and percent of channel containing rubble increased. With increasing order, channel gradient, channel elevation, and percent of channel composed of gravel decreased. As stream order increased, the number of fish species, summer water space (depth times surface area) for fish, and the total numbers of fish increased. With increasing order, the numbers of chinook salmon, rainbow trout, and sculpin increased, but the numbers of cutthroat trout and Dolly Varden decreased. The analysis demonstrated the value of headwater streams to Dolly Varden and to cutthroat and rainbow trout and resulted in management's emphasizing protection of such waters. Stream order can be used to determine approximate stream size by providing estimate of width and depth.

79-002946 Sjoblom, V. THE EFFECT OF CLIMATIC VARIATIONS ON FISHING AND FISH POPULATIONS. Fennia 150: 33-37. 1978. SFA 24(4)
[Finnish Game Fish Res. Inst., P.O. Box 193, SF-00131 Helsinki 13, Finland]

79-002947 Smith, S. L.; Crumpton, J. E. INTERRELATIONSHIP OF VEGETATIVE COVER AND SUNFISH POPULATION DENSITY IN SUPPRESSING SPAWNING IN LARGEMOUTH BASS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 318-321. 1977[1979]. SFA 24(4)
[Fla. Game Fresh Water Fish Comm., P.O. Box 1903, Eustis 32726] Largemouth bass (/Micropterus salmoides/) fail to spawn in association with dense populations of sunfish (/Lepomis/ sp.). Previous studies have demonstrated that suppression is behavioral in nature and linked to interspecific competition for space within spawning areas. In 1976 a series of ponds were stocked with 3 pairs of bass and densities of sunfish from 0-458 kg/ha to determine the density necessary to effect suppression. Results were inconclusive with spawning occurring in all ponds but only late in the season in ponds stocked at 250 kg/ha or above. It was not clear whether the growth of aquatic vegetation or cropping of the sunfish population resulted in spawning in these ponds. In 1977 a second series of paired ponds (1 with vegetation, 1 without) were stocked with 3 pairs of bass and sunfish at densities of 0-448 kg/ha. In ponds without vegetative cover bass spawning was completely suppressed at 336 kg sunfish/ha but spawning occurred in all ponds with vegetative cover (maximum of 448 kg sunfish/ha).

79-002948 Swenson, W. A. INFLUENCE OF TURBIDITY ON FISH ABUNDANCE IN WESTERN LAKE SUPERIOR. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-067. vii + 84p. July 1978. SFA 24(4)
[Dep. Biol., Univ. Wis., Superior 54880] This research project was developed to improve understanding of the influence of turbidity on fish populations and the mechanism through which its effects are induced. Field and laboratory studies emphasized measurement of behavioral response of fish and resulting changes in fish species interrelationships in western Lake Superior. Direct effects of red

79-002948 CONTINUED
clay turbidity on survival and growth of larval lake herring (/Coregonus artedii/) were also measured. Field measurements demonstrated that light penetration in western Lake Superior is reduced significanly even at very low levels of red clay turbidity. Zooplankton and fish abundance and distribution were influenced by turbidity. Zooplankton abundance and distribution was highest near the surface in red clay plumes. Smelt (/Osmerus mordax/) move into the upper 12 m of water in response to turbidity where their predation on larval fish increases. Predation by smelt on larval lake herring was identified as a factor contributing to the decline of the formerly abundant western Lake Superior lake herring population and the commercial fishery which depended upon it. Walleye (/Stizostedion vitreum vitreum/) and lake trout (/Salvelinus namaycush/) demonstrated opposite responses to turbidity. Walleye concentrated in turbid water where food availability was apparently greater. Lake trout showed partial avoidance to turbidity in the lake and in laboratory turbidity gradients.

IDENTIFICATION, KEYS, CLASSIFICATION

79-002949 Campos, H. MULTIVARIATE ANALYSIS OF THE TAXONOMY OF THE FISH FAMILY GALAXIIDAE. Zool. Anz. 202 (3-4): 280-288. 1979. SFA 24(4)
[Inst. Zool. Univ. Austral, Valdivia, Chile]

79-002950 Compagno, L. J. V. CARCHARHINOID SHARKS: MORPHOLOGY, SYSTEMATICS, AND PHYLOGENY. (VOLUMES I AND II). Ph.D. dissertation, Stanford Univ. 951p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(2): 629. Aug. 1979. SFA 24(4)

79-002951 Fitzsimons, J. M. STATUS OF THE NOMINAL SPECIES OF THE FISH GENUS /XENOOPHORUS/ (GOODEIDAE, CYPRINODONTIFORMES) FROM MEXICO. Occas. Pap. Mus. Zool. La State Univ. No. 51. 18p. 20 Apr. 1979. SFA 24(4)
[Mus. Zool., La. State Univ., Baton Rouge 70893]

79-002952 Gaudant, M. RECHERCHES SUR LES RELATIONS PHYLOGENETIQUES DE CERTAINS POISSONS EURYPTERYGII DU CRETACE DE LA MESOGEE OCCIDENTALE. [ON THE PHYLOGENETIC RELATIONSHIPS OF SOME EURYPTERGIAN FISHES FROM THE CRETACEOUS OF WESTERN TETHYS.] C. R. Seances Acad. Sci. Ser. D Sci. Nat. 288 (13): 1047-1050. 2 Apr. 1979. In French with English summ. SFA 24(4)
[Inst. Paleontol. Mus., L.A.no. 12, 8 rue de Buffon, 75005 Paris, France]

79-002953 Gritsenko, O. F. INVESTIGATIONS OF PACIFIC REDFIN VIEWED AS PERSPECTIVE OBJECTS FOR SEA CULTURE AND ACCLIMATION. PART I. SYSTEMATICS. Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 139-147. 1974[1977]. SFA 24(4)
[VNIRO, 17 Krasnoselskaya, Moscow B-140, USSR]

79-002954 Hoese, D. F.; Winterbottom, R. A NEW SPECIES OF /LIOTERES/ (PISCES, GOBIIDAE) FROM KWAZULU, WITH A REVISED CHECKLIST OF SOUTH AFRICAN GOBIES AND COMMENTS ON THE GENERIC RELATIONSHIPS AND ENDEMISM OF WESTERN INDIAN OCEAN GOBIOIDS. R. Ont. Mus. Life Sci. Occas. Pap. No. 31. 13p. 28 Feb. 1979. SFA 24(4)
[Dep. Ichthyol., Aust. Mus., Sydney, Australia]

79-002955 Mayden, R. L.; Page, L. M. SYSTEMATICS OF /PERCINA ROANOKA/ AND /P. CRASSA/, WITH COMPARISONS TO /P. PELTATA/ AND /P. NOTOGRAMMA/ (PISCES: PERCIDAE). Copeia 1979 (3): 413-426. 1 Aug. 1979. SFA 24(4)
[Dep. Zool., South. Ill. Univ., Carbondale 62901]

79-002956 McCarthy, L. V. EASTERN PACIFIC /RYPTICUS/ (PISCES: GRAMMISTIDAE). Copeia 1979 (3): 393-400. 1 Aug. 1979. SFA 24(4)
[6034 Coliseum, New Orleans, LA 70118]

79-002957 Paulin, C. D. NEW ZEALAND ROUGHIES (PISCES: BERYCOMORPHII: TRACHICHTHYIDAE). N.Z. J. Zool. 6 (1): 69-76. Mar. 1979. SFA 24(4)
[Natl. Mus. N.Z., Private Bag, Wellington, New Zealand]

79-002958 Starnes, W. C.; Starnes, L. B. TAXONOMIC STATUS OF THE PERCID FISH /ETHEOSTOMA NIGRUM SUSANAE/. Copeia 1979 (3): 426-430. 1 Aug. 1979. SFA 24(4)
[Dep. Zool., Univ. Tenn., Knoxville 37916]

79-002959 Weitzman, S. H.; Balph, M. H. SOME PHYLOGENETIC IMPLICATIONS OF DISCOVERY OF /ASPIDORAS PAUCIRADIATUS/ (PISCES: SILURIFORMES: CALLICHTHYIDAE) FROM THE RIO NEGRO IN BRAZIL. Proc. Biol. Soc. Wash. 92 (1): 10-22. 18 July 1979. In English with Portuguese summ. SFA 24(4)
[Dep. Vert. Zool., Smithsonian Inst., Washington, DC 20560]

79-002960 Wiley, E. O. THE PHYLOGENETIC RELATIONSHIPS OF /LATIMERIA CHALUMNAE/. Trans. Kans. Acad. Sci. 81: 93-94. 1978. Abstract only. SFA 24(4)
[Mus. Nat. Hist., Univ. Kans., Lawrence]

79-002961 Wilson, M. V. H. A SECOND SPECIES OF /LIBOTONIUS (PISCES: PERCOPSIDAE) FROM THE EOCENE OF WASHINGTON STATE. Copeia 1979 (3): 400-405. 1 Aug. 1979. SFA 24(4)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

79-002962 Woodland, D. J.; Randall, J. E. /SIGANUS PUELLOIDES/, A NEW SPECIES OF RABBITFISH FROM THE INDIAN OCEAN. Copeia 1979 (3): 390-393. 1 Aug. 1979. SFA 24(4)
[Dep. Zool., Univ. New England, Armidale, N.S.W., 2351, Australia]

PARASITES AND DISEASES-GENERAL

79-002963 Arizono, M.; Nagai, A. [AN APPLICATION OF HAEMATOLOGICAL TESTING FOR DISEASE DIAGNOSIS IN CULTURED YELLOWTAIL (/SERIOLA QUINQUERADIATA/).] J. Fac. Mar. Sci. Technol. Tokai Univ. No. 12. p. 119-133. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Japan]

79-002964 Dartnall, H. J. G.; Walkey, M. PARASITES OF MARINE STICKLEBACKS. J. Fish Biol. 14 (5): 471-474. May 1979. SFA 24(4)
[British Antarctic Surv., Madingley Rd., Cambridge CB3 0ET, England]
A total of three specimens of /Spinachia spinachia/ and 11 /Gasterosteus aculeatus/ were caught in Loch Etive, Scotland. The salinity of the water at the capture site was 23 °/oo. Nine species of parasites were collected from individuals of the mixed population of sticklebacks which included seven new parasite records for the British Isles.

79-002965 Fryer, J. L.; Rohovec, J. S.; Pulford, E. F.; Olson, R. E; Ransom, D. P.; Winton, J. R.; Lannan, C. N.; Hedrick, R. P.; Groberg, W. J. PROCEEDINGS FROM A CONFERENCE ON DISEASE INSPECTION AND CERTIFICATION OF FISH AND FISH EGGS. Oreg. State Univ., Sea Grant Coll. Proj. Publ. No. ORESU-W-79-001. 40p. June 1979. Available from Sea Grant Communications, Oreg. State Univ., Corvallis 97331]

79-002966 Hendrickson, R. G.; Biyono, B.; Carlander, K. D. INCIDENCE OF HELMINTH PARASITES IN SOME FISHES FROM RAWA PENING. J. Satya Wacana Res. 1 (4): 392-397. 1978. SFA 24(4)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50010]

79-002967 Jensen, L. A.; Moser, M.; Heckmann, R. A. THE PARASITES OF THE CALIFORNIA LIZARDFISH, /SYNODUS LUCIOCEPS/. Proc. Helminthol. Soc. Wash. 46 (2): 281-284. July 1979. SFA 24(4)
[Dep. Biol. Sci., Univ. North. Colo., Greeley 80639]

79-002968 Pohley, W. J. SOME PARASITES OF THE LARGEMOUTH BASS, /MICROPTERUS SALMOIDES/, IN CONNECTICUT. Ph.D. dissertation, Univ. Conn. 55p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(1):119. July 1979. SFA 24(4)
Examination of 98 largemouth bass (/Micropterus salmoides/) from 3 reservoirs in Connecticut yielded 23 species of parasites including 3 monogenetic trematodes, 7 digenetic trematodes, 2 cestodes, 1 acanthocephalan, 5 nematodes, 1 annelid, 3 copepods, and 1 mollusc. Seventeen of these represent new records for New England. Data are presented on the incidence and intensity of infection with respect to host age, season, and collection locality.--From abstr.

79-002969 Roberts, R. J. , (ed.) FISH PATHOLOGY. Bailliere Tindall Div. Cassell Ltd., London x + 318p. 1978. Available at $64.00 from Lea & Febiger, 600 South Washington Square, Philadelphia, PA 19106. SFA 24(4)

Although intensive fish culture is on the increase throughout the world, the high incidence of disease resulting from intensive cultural methods continues to be a major constraint to their successful economic development. This book, written by an interdisciplinary team of experts, provides the necessary background knowledge about the teleost fish that is essential for the veterinarian, agriculturalist, microbiologist, parasitologist, nutritionist, or hydrologist concerned with, or involved in, fish diseases. Extensive knowledge of environmental constraints in an aqueous existence, physiology of survival in such a milieu, and numerous infection-causing agents and host responses to these agents are all considered within the context of husbandry and economics. The text provides thorough discussion of immunology, neoplasia, virology, parasitology, bacteriology, mycology, and nutritional pathology of teleosts, as well as miscellaneous non-infectious diseases, laboratory methods, therapy of fish diseases, and husbandry and management in relation to disease.--From publisher

79-002970 Sikama, Y. [PATHOLOGICAL STUDY OF FISH DISEASES.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 1: 41-49. 1972[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ, Shimizu, Japan]

BACTERIAL DISEASES

79-002971 Anderson, D. P.; Roberson, B. S.; Dixon, O. W. PLAQUE-FORMING CELLS AND HUMORAL ANTIBODY IN RAINBOW TROUT (/SALMO GAIRDNERI/) INDUCED BY IMMERSION IN A /YERSINIA RUCKERI/ O-ANTIGEN PREPARATION. J. Fish. Res. Board Can. 36 (6): 636-639. June 1979. In English with French summ. SFA 24(4)
[U.S. FWS, Natl. Fish Health Res. Lab., Kearneysville, WV 25430]

79-002972 Bullock, G. L.; Snieszko, S. F. ENTERIC REDMOUTH DISEASES OF SALMONIDS. U.S. Fish Wildl. Serv. Fish Dis. Leafl. No. 57. 7p. 1979. SFA 24(4)
[Natl. Fish Cent., Kearneysville, WV 25430]

79-002973 Hikida, M.; Wakabayashi, H.; Egusa, S.; Masumura, K. /FLEXIBACTER/ SP., A GLIDING BACTERIUM PATHOGENIC TO SOME MARINE FISHES IN JAPAN. Bull. Jpn. Soc. Sci. Fish. 45 (4): 421-428. Apr. 1979. SFA 24(4)
[Dep. Fish., Fac. Agric., Univ. Tokyo, Bunkyo-ku, Tokyo 113, Japan]

79-002974 Hilliard, R. W.; Pass, D. A.; Potter, I. C. HAEMORRHAGIC SEPTICAEMIA IN THE LAMPREY /GEOTRIA AUSTRALIS/ GRAY. Acta Zool. (Stockh.) 60 (2): 115-121. 1979. SFA 24(4)
[Sch. Environ. Life Sci., Murdoch Univ., Murdoch, Western Australia 6153] The early upstream migrants of the lamprey, /Geotria australis/, were occasionally found dead in the field and suffered a very heavy mortality when held in the laboratory. The clinical signs exhibited by dying animals included the production of massive amounts of mucus, petechial haemorrhage of the skin and fins, and both haemorrhage and oedema around the eyes. Necropsy also revealed

79-002974 CONTINUED
haemorrhage and oedema in various internal structures and in one case thrombosis and degeneration of blood vessels in the gill. The disease was attributed to infection with /Aeromonas hydrophila/ and /Pseudomonas fluorescens/ which were cultured from the organs of diseased animals. No signs of this disease occurred when the aquaria water was treated with chlortetracycline immediately after the introduction of each new batch of animals.

79-002975 Kitao, T.; Aoki, T.; Iwata, K. [EPIDEMIOLOGICAL STUDY ON STREPTOCOCCICOSIS OF CULTURED YELLOWTAIL (/SERIOLA QUINQUERADIATA/)--I. DISTRIBUTION OF /STREPTOCOCCUS/ SP. IN SEAWATER AND MUDS ARCUND YELLOWTAIL FARMS.] Bull. Jpn. Soc. Sci. Fish. 45 (5): 567-572. May 1979. In Japanese with English summ. SFA 24(4)
[Dep. Fish., Fac. Agric., Miyazaki Univ., Miyazaki 880, Japan]

79-002976 Kusuda, R. [BACTERIAL DISEASES OF MARINE CULTURED FISHES AND TREATMENT BY VACCINE.] Proc. Sov.-Jpn. Jcint Symp. Aquacult. 5: 229-243. 1976[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Agric., Kochi Univ., Nangoku, Kochi-ken, Japan]

79-002977 Lester, R. J. G.; Budd, J. SOME CHANGES IN THE BLOOD CELLS OF DISEASED COHO SALMON. Can. J. Zool. 57 (7): 1458-1464. July 1979. In English with French summ. SFA 24(4)
[Dep. Parasitol., Univ. Queensland, Brisbane, Austrlia 4067]

79-002978 Stuht, J.; Hildebrandt, T.; Fay, L. SEARCH FOR TYPE E BOTULISM IN FISH FROM INLAND WATERS. Mich. Dep. Nat. Resour. Wildl. Div. Rep. No. 2777. 4p. 22 Feb. 1977. SFA 24(4)
[Mich. Dep. Nat. Resour., Lansing 48926] /Clostridium botulinum/ toxins type E and C were not detected in cultures of flesh and intestinal tract from 21 species of fish collected from inland waters following fish management chemical reclamation projects.

FUNGAL DISEASES

79-002979 Inslee, T. D. A PRELIMINARY REPORT ON THE CONTROL OF PATHOGENIC FUNGI IN EARTHEN CULTURE PONDS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 418-421. 1977[1979]. SFA 24(4)
[U.S. FWS, Fish Cult. Dev. Cent., Tishomingo, OK 73460]

79-002980 Kojima, H. [EFFECTS OF TANNIC ACID ON AQUATIC FUNGI ASSOCIATED WITH DISEASES OF FISH EGGS.] Sci. Rep. Hokkaido Fish Hatchery 33: 45-53. Dec. 1978. In Japanese with English summ. SFA 24(4)
[Hokkaido Fish Hatchery, Hokkaido, Japan]

PROTOZOAN DISEASES

79-002981 Awakura, T.; Tonosaki, H. [STUDIES ON /HENNEGUYA/ SPP. (PROTOZOA: MYXOSPORIDIA) PARASITIC IN GOBIID FISHES.] Sci. Rep. Hokkaido Fish Hatchery 33: 101-115. Dec. 1978. In Japanese with English summ. SFA 24(4)
[Hokkaido Fish Hatchery, Hokkaido, Japan]

79-002982 Bower, S. M.; Woo, P. T. K. THE PREVALENCE OF /TRYPANOSOMA CATOSTOMI/ IN WHITE SUCKER (/CATOSTOMUS COMMERSONI/) FROM SOUTHERN ONTARIO. J. Wildl. Dis. 15 (3): 429-431. July 1979. SFA 24(4)
[P. T. K. Woo: Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada]
During the summer of 1975, 285 white suckers (/Catostomus commersoni/) from 10 localities in southern Ontario were examined for trypanosomes. /Trypanosoma catostomi/ Daly and DeGiusti, 1971 was found in the blood of 11.6 percent of the fish examined using the haematocrit centrifugation technique. Infected juvenile fish (33 percent) and infected adult fish (4 percent) were found in 6 of 10 locations.

79-002983 Current, W. L. /HENNEGUYA ADIPOSA/ MINCHEW (MYXOSPORIDA) IN THE CHANNEL CATFISH: ULTRASTRUCTURE OF THE PLASMODIUM WALL AND SPOROGENESIS. J. Protozool. 26 (2): 209-217. May 1979. SFA 24(4)
[Dep. Zool.-Entomol., Auburn Univ., Auburn, AL 36830]

79-002984 Letch, C. A. HOST RESTRICTION, MORPHOLOGY AND ISOENZYMES AMONG TRYPANOSOMES OF SOME BRITISH FRESHWATER FISHES. Parasitology 79 (1): 107-117. Aug. 1979. SFA 24(4)
[Dep. Med. Protozool., London Sch. Hyg. Trop. Med., Keppel St., London WC1E 7HT, England]

79-002985 Letch, C. A.; Ball, S. J. PREVALENCE OF /TRYPANOSOMA COBITIS/ MITROPHANOW, 1883 IN FISHES FROM THE RIVER LEE. Parasitology 79 (1): 119-124. Aug. 1979. SFA 24(4)
[Dep. Med. Protozool., London Sch. Hyg. Trop. Med., Keppel St., London WC1E 7HT, England]

79-002986 Lewis, R. E.; Siler, J. R.; Olmsted, L. L. PREVALENCE AND INTENSITY OF /EPISTYLIS/ ON FISHES FROM TWO NORTH CAROLINA RESERVOIRS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 372-379. 1977[1979]. SFA 24(4)
[Environ. Sci. Unit, Duke Power Co., Huntersville, NC 28078]

79-002987 O'Grodnick, J. J. SUSCEPTIBILITY OF VARIOUS SALMONIDS TO WHIRLING DISEASE (/MYXOSOMA CEREBRALIS/). Trans. Am. Fish. Soc. 108 (2): 187-190. Mar. 1979. SFA 24(4)
[Pa. Fish Comm., Benner Spring Fish Res. Stn., Bellefonte 16823]

VIRAL DISEASES

79-002988 Beckwith, D. G.; Malsberger, R. G. CHARACTERIZATION AND MORPHOLOGY OF THE BLUEGILL VIRUS. J. Gen. Virol. 43 (3): 489-501. June 1979. SFA 24(4)
[Dep. Pathol., St. Luke's Hosp. Bethlehem, PA 18015] An enveloped, ether-sensitive, acid-labile virus isolated from /Lepomis macrochirus/, the bluegill, is described. Virus replication is limited to teleostean cell lines and achieves highest titres in centrarchid cells. As determined by the uptake of tritiated nucleotides and the effect of 6-azauridine and actinomycin D on replication, the virus genome is RNA. The Virus has no haemagglutinin or neuraminidase nor does it share antigens with prototypes of orthomyxoviruses, paramyxoviruses or arenaviruses. Thin-section electron microscopy reveals a virion 80 to 100 nm in diam. associated with the cell surface and intracellular vacuoles. The virus appears to mature by budding and exhibits a prolonged replication cycle and significant cell-associated infectivity. The time sequence of replication indicates that the prolonged cycle is due to maturation rather than to delayed synthesis of RNA and protein. The bluegill virus (BGV) represents a novel, hitherto undescribed, type of teleostean virus.

OTHER DISEASES AND PARASITES

79-002989 Andersen, K. ABNORMAL GROWTH PATTERN OF /DIPHYLLOBOTHRIUM DENDRITICUM/ IN RAINBOW TROUT. J. Helminthol. 53 (1): 39-40. Mar. 1979. SFA 24(4)
[Zool. Mus., Univ. Oslo, Sars gt. 1, Oslo 5, Norway]

79-002990 Bjorge, A. J. AN ISOPOD AS INTERMEDIATE HOST OF COD-WORM. Fiskeridir. Skr. Ser. Havunders. 16 (14): 561-565. 1979. SFA 24(4)
[Inst. Mar. Biol. Limnol., Univ. Oslo, Norway] Ten cod (/Gadus morhua/), caught at 30-50 m depth in the Froan area (64°N) on the Norwegian coast in October 1977, held an average of 53 cod-worm (/Phocanema decipiens/) larvae in their muscles. Stomach contents included fish, amphipods and isopods. Of 87 isopods, 84 were identified as /Idothea neglecta/ and from these one /P. decipiens/ larva was recovered. The findings suggest that /I. neglecta/ is a significant food resource for coastal cod, and that this isopod also is a first intermediate host of cod-worm.

79-002991 Cochran, M. L. NEMATODE PARASITES IN FRESHWATER FISHES OF ALABAMA AND GEORGIA. Ga. J. Sci. 37 (3/4): 199-204. June-Sept. 1979. SFA 24(4)
[Div. Sci. Math., Gordon Junior Coll., Bainesville, GA 30204] /Camallanus oxycephalus/ was the most widespread nematode occuring in 9 host species. Family specificity is indicated in /Philometra/ sp. (undescribed) encountered only in the fish family Centrarchidae. Generic specificity is indicated in /Philometroides/ sp. cf. /Nodulosa/ found only in fish genus /Micropterus/.

79-002992 Gillespie, D. C.; Evans, R. E. COMPOSITION OF GRANULES FROM KIDNEYS OF RAINBOW TROUT (/SALMO GAIRDNERI/) WITH NEPHROCALCINOSIS. J. Fish Res. Board Can. 36 (6): 683-685. June 1979. In English with French summ. SFA 24(4)
[R. E. Evans: Dep. Fish. Oceans, Freshwater Inst., Winnipeg, MB R3T 2N6, Canada]

79-002993 Hard, G. C.; Williams, R.; Lee, J. SURVEY OF DEMERSAL FISH IN PORT PHILLIP BAY FOR INCIDENCE OF NEOPLASIA. Aust. J. Mar. Freshwater Res. 30 (1): 73-79. Feb. 1979. SFA 24(4)
[Fels Res. Inst., Temple Univ. Sch. Med., Philadelphia, PA 19140] A survey aimed at determining the incidence of neoplasms, particularly superficial tumours, in the common demersal fish species in zones of Port Phillip Bay exposed to domestic and industrial contamination has been conducted on a monthly basis over a period of 17 months. Trawling at three sampling stations provided sufficient numbers for scrutiny of a range of species, including /Rhombosolea tapirina/, /Ammotretis rostratus/, Platycephalus bassensis/, /P. caeruleopunctatus/, /Atopomycterus nicthemerus/, /Sphaeroides glaber/, /Navodon multiradiatus/, /Scobinichthys granulatus/, /Brachaluteres trossulus/ and /Paratrigla papilio/. In contrast with the experience overseas of epidermal papillomas in certain species of pleuronectids, the Port Phillip Bay flounder were totally free of skin tumours. Only two true neoplasms were encountered, a neurilemmoma and a lipoma, both of these being from specimens of /P. bassensis/. A high incidence of non-neoplastic skin 'tumours' was observed in certain leatherjackets (family Balistidae). The essentially negative findings in terms of cancer incidence provides a reference base for any future studies examining disease patterns in faunal populations of Port Phillip Bay.

79-002994 Ishikawa, T.; Takayama, S. IMPORTANCE OF HEPATIC NEOPLASMS IN LOWER VERTEBRATE ANIMALS AS A TOOL IN CANCER RESEARCH. J. Toxicol. Environ. Health 5 (2-3): 537-550. Mar.-May 1979. SFA 24(4)
[Dep. Exp. Pathol., Cancer Inst., Tokyo, Japan] Hepatic tumors were induced in medakas (/Oryzias latipes/) by the addition of diethylnitrosamine (DEN) to their aquarium water. Medakas are useful for study because they are highly susceptible to the carcinogenic effect of DEN and the time for tumor induction is relatively short. Tumors had a histological pattern similar to that of mammalian hepatic tumors. The medaka seems to be susceptible to water-soluble carcinogens.

79-002995 Jilek, R. HISTOPATHOLOGY DUE TO THE PRESENCE OF /GRACILISENTIS GRACILISENTIS/ IN /DOROSOMA CEPEDIANUM/ (LE SUEUR). J. Fish Biol. 14 (6): 593-595. June 1979. SFA 24(4)
[Dep. Zool., Ohio State Univ., Columbus 43210] The acanthocephalan, /Gracilisentis gracilisentis/, infects the pyloric caeca and small intestine of /Dorosoma cepedianum/. Sections of intestinal tissue were examined microscopically and indicated pathological lesions were produced by /G. gracilisentis/ in the mucosa and submucosa. /G. gracilisentis/ occurs during the period of seasonal mortalities of /D. cepedianum/ and may be responsible for such mortalities.

79-002996 Kayton, R. J.; Kritsky, D. C.; Tobias, R. C. /RHABDOCHONA CATOSTOMI/ SP. N. (NEMATODA: RHABDOCHONIDAE) FROM THE INTESTINE OF /CATOSTOMUS/ SPP. (CATOSTOMIDAE). Proc. Helminthol. Soc. Wash. 46 (2): 224-227. July 1979. SFA 24(4)
[Dep. Biol., Idaho State Univ., Pocatello 83209]

79-002997 Kazic, D. ENDOHELMINTHS OF SALMONIDA FROM THE ARTIFICIAL LAKE PIVA, MONTENEGRO, YUGOSLAVIA. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2154-2158. 1978. SFA 24(4)
[Biol. Zavod, YU-81000 Titograd, Yugoslavia]

79-002998 Mills, C. A.; Anderson, R. M.; Whitfield, P. J. DENSITY-DEPENDENT SURVIVAL AND REPRODUCTION WITHIN POPULATIONS OF THE ECTOPARASITIC DIGENEAN /TRANSVERSOTREMA PATIALENSE/ ON THE FISH HOST. J. Anim. Ecol. 48 (2): 383-399. June 1979. SFA 24(4)
[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham Dorset BH20 6BB, England]

79-002999 Parukhin, A. M.; Lyadov, V. N. [NEW GENUS AND SPECIES OF TREMATODES, FISH PARASITES IN THE SUBANTARCTIC ZONE OF THE INDIAN OCEAN.] Zool. Zh. 58 (5): 637-642. May 1979. In Russian with English summ. SFA 24(4)
[Inst. Biol. South. Seas, Sevastopol, USSR]

79-003000 Raibaut, A.; Coste, F.; Hassine, O. K. B. /COLOBOMATUS LABRACIS/ DELAMARE DEBOUTTEVILLE ET NUNES, 1952 (COPEPODA, PHILICHTHYIDAE), PARASITE DU LOUP /DICENTRARCHUS LABRAX/ (LINNE, 1758) EN MEDITERRANEE OCCIDENTALE. [/COLOBOMATUS LABRACIS/ DELAMARE DEBOUTTEVILLE AND NUNES, 1952 (COPEPODA, PHILICHTHYIDAE), A PARASITE OF THE SEA BASS /DICENTRARCHUS LABRAX/ (LINNE, 1758) FROM WESTERN MEDITERRANEAN SEA.] Z. Parasitenkd. 59 (1): 79-85. 1979. In French with English summ. SFA 24(4)
[Lab. Ichthyol., Univ. Sci. Tech. Languedoc, Place E.-Bataillon, F-34060 Montpellier Cedex, France]

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[Dep. Biol. Pathol., McMaster Univ., Hamilton, ON, Canada]

79-003002 Suriano, D. M.; Beverley-Burton, M. /INTERNILOCULUS CHILENSIS/ GEN. ET SP. NOV. (MONOGENEA: CAPSALIDAE) REPRESENTANT D'UNE NOUVELLE SOUS-FAMILLE: INTERNILOCULINAE PARASITE DES BRANCHIES DE /HELICOLENUS LENGERICHI/ NORMAN (PISCES: SCORPAENIDAE) DE L'OCEAN PACIFIQUE SUD. [/INTERNILOCULUS CHILENSIS/ GEN. ET SP. NOV. (MONOGENEA: CAPSALIDAE), REPRESENTING A NEW SUB-FAMILY, INTERNILOCULINAE, GILL PARASITE OF /HELICOLENUS LENGERICHI/ NORMAN (PICES: SCORPAENIDAE) OF THE SOUTH PACIFIC OCEAN.] Can. J. Zool. 57 (6): 1201-1205. June 1979. In French with English summ. SFA 24(4)
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79-003003 Voorhees, J. T.; Schwartz, F. J. ATTACHMENT SITE, SEASONALITY, AND EFFECTS OF THE PARASITIC COPEPOD /LERNAEENICUS RADIATUS/ ON TWO ESTUARINE FISHES IN THE CAPE FEAR RIVER, NORTH CAROLINA. Trans. Am. Fish. Soc. 108 (2): 191-196. Mar. 1979. SFA 24(4)
[Inst. Mar. Sci., Univ. N. Car., Morehead City 28557]

79-003004 Yasumoto, T.; Inoue, A.; Bagnis, R.; Garcon, M. ECOLOGICAL SURVEY ON A DINOFLAGELLATE POSSIBLY RESPONSIBLE FOR THE INDUCTION OF CIGUATERA. Bull. Jpn. Soc. Sci. Fish. 45 (3): 395-399. Mar. 1979. SFA 24(4)
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POLLUTION

79-003005 Armstrong, F. A. J.; Scott, D. P. DECREASE IN MERCURY CONTENT OF FISHES IN BALL LAKE, ONTARIO, SINCE IMPOSITION OF CONTROLS ON MERCURY DISCHARGES. J. Fish. Res. Board Can. 36 (6): 670-672. June 1979. In English with French summ. SFA 24(4)
[Dep. Fish. Oceans, Freshwater Inst., Winnipeg, MB R3T 2N6, Canada]

79-003006 Battelle Pacific Northwest Laboratories SYNTHESIS AND ANALYSIS OF ECOLOGICAL INFORMATION FROM COOLING IMPOUNDMENTS. VOL. 1. Elec. Power Res. Inst. EPRI EA-1054. xv + 101p. Apr. 1979. SFA 24(4)
[Battelle Blvd., Richland, WA 99352]

79-003007 Burton, D. T.; Hall, L. W., Jr.; Margrey, S. L. MULTIFACTORIAL CHLORINE, DELTA T AND EXPOSURE DURATION STUDIES OF POWER PLANT EFFLUENTS ON ESTUARINE ICHTHYOPLANKTON. Proc. Mid-Atl. Ind. Waste Conf. 11: 223-229. 1979. SFA 24(4)
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79-003008 Buynak, G. L.; Gurzynski, A. J. AGE AND GROWTH OF SMALLMOUTH BASS (/MICROPTERUS DOLOMIEUI/) IN A LARGE RIVER POLLUTED BY ACID MINE DRAINAGES. Proc. Pa. Acad. Sci. 52 (2): 176-178. 1978. SFA 24(4)
[Ichthyological Assoc., Inc., R. D. 1, Berwick, PA 18603] Growth rates of smallmouth bass (/Micropterus dolomieui/) collected in the Susquehanna River at SSES (heavily polluted by acid mine drainage) and Falls, Pennsylvania (slightly polluted) were studied in 1976. Ninety percent of the specimens collected were between 2 and 5 years old; the oldest was 8 years. No significant difference in growth rates was found between males and females. At both stations, growth rates were similar and most rapid during the first 2 years, but in 3- and 4-year-old fish, growth at SSES was significantly slower (P is less than 0.05) than at Falls. The difference was probably due to a scarcity of food that resulted from mine drainage pollution.

79-003009 Canton, S. P.; Ward, J. V. ENVIRONMENTAL EFFECTS OF WESTERN COAL SURFACE MINING. PART II-THE AQUATIC MACROINVERTEBRATES OF TROUT CREEK, COLORADO. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-095. ix + 63p. Oct. 1978. SFA 24(4)
[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523] A study was conducted on Trout Creek in northwestern Colorado to assess effects of coal mine drainage on stream macroinvertebrates. Density and biomass exhibited a general increase in the downstream direction throughout the study area and showed marked seasonal variation. Aquatic insects comprised over 90 percent of the fauna with caddisflies (Trichoptera) predominating. Diversity did not vary significantly throughout the study area. None of the parameters measured showed any definite indication of stressed conditions in the macroinvertebrate community during the study period. Water quality was diminished primarily during spring runoff and the invertebrates seemed able to withstand this short period of water quality degradation. The buffer zone present between the mine area and Trout Creek may decrease the effects of mine drainage and should remain to insure the maintenance of a stable macroinvertebrate community in Trout Creek.

79-003010 Chung, K. S.; Strawn, K. HEAT TOLERANCE OF FREE-LIVING ESTUARINE ANIMALS TO PREDICT THEIR SURVIVAL IN HEATED EFFLUENTS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 612-617. 1977[1979]. SFA 24(4)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843] Individual heat resistance times were determined in 180 min experiments during June 1974 through September 1975 for 8 species of crustaceans and 47 fishes taken directly from the intake canal of the P. H. Robinson Generating Station, Bacliff, Texas. Individual resistance times increased with an increase in capture temperature and with a decrease in test temperature. June-September is the most thermally critical period of the year for animals transported by the power plant from intake water and exposed to hot discharge effluent. During the rest of the year, nearly all organisms survived 3 h at temperatures higher than average discharge canal temperature.

79-003011 Dean, W. J., Jr.; Bailey, W. H. REPRODUCTIVE REPRESSION OF LARGEMOUTH BASS IN A HEATED RESERVOIR. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 463-470. 1977[1979]. SFA 24(4)
[Tex. Parks Wildl. Dep., San Antonio 78216]

79-003012 Elser, A. A.; Schreiber, J. C. ENVIRONMENTAL EFFECTS OF WESTERN COAL COMBUSTION. PART I--THE FISHES OF ROSEBUD CREEK, MONTANA. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-098. viii + 34p. Nov. 1978. SFA 24(4)
[Mont. Dep. Fish Game, Miles City 59301] During the study, there was no apparent effect of either coal mining or coal combustion activities on the distribution of fishes in Rosebud Creek.--From abstr.

79-003013 Goehle, K. H. DISTRIBUTIONAL RESPONSES OF BENTHIC MACROINVERTEBRATES TO A THERMAL DISCHARGE. Ph.D. dissertation, State Univ. N.Y. (Buffalo) 243p. 1979. From Diss. Abstr. Int. B Sci. Eng. 39(12, part 1):5738. June 1979. SFA 24(4)

79-003014 Goerke, H.; Eder, G.; Weber, K.; Ernst, W. PATTERNS OF ORGANOCHLORINE RESIDUES IN ANIMALS OF DIFFERENT TROPHIC LEVELS FROM THE WESER ESTUARY. Mar. Pollut. Bull. 10 (5): 127-132. May 1979. SFA 24(4)
[Inst. Meeresforsch., D-2850 Bremerhaven, West Germany]

79-003015 Goldman, J. C. CHLORINE IN THE MARINE ENVIRONMENT. Oceanus 22 (2): 36-43. 1979. SFA 24(4)
[Woods Hole Oceanogr. Inst., Woods Hole, MA]

79-003016 Gray, L. J.; Ward, J. V. ENVIRONMENTAL EFFECTS OF OIL SHALE MINING AND PROCESSING. PART II--THE AQUATIC MACROINVERTEBRATES OF THE PICEANCE BASIN, COLORADO, PRIOR TO OIL SHALE PROCESSING. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-097. viii + 40p. Oct. 1978. SFA 24(4)
[Dep. Zool. Entomol., Colo. State Univ., Fort Collins 80523]

79-003017 Henriksen, A. PAVISNING OG MALING AV FORSURING AV OVERFLATEVANN. [IDENTIFYING AND MEASURING ACIDIFICATION OF FRESHWATER.] Nor. Inst. Vannforsk. 1978: 13-19. 1979. In Norwegian with English summ. SFA 24(4)
[Norsk Inst. Vannforskning, Oslo, Norway]

79-003018 Hergott, S.; Jenkins, D.; Thomas, J. F. POWER PLANT COOLING WATER CHLORINATION IN NORTHERN CALIFORNIA. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-032. xii + 65p. Mar. 1978. SFA 24(4)
[Coll. Eng., Univ. Calif., Berkeley 94720]

79-003019 Ikenberry, E. A.; Fairchild, E. D. A REPORT ON THE EFFECTS OF INORGANIC POLLUTION ON THE ALGAE AND FISH COMMUNITIES OF SHORT CREEK. Trans. Kans. Acad. Sci. 81: 107. 978. Abstract only. SFA 24(4)
[Dep. Biol., Pittsburgh State Univ., Pittsburgh, KS]

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[Lab. Food. Hygenic Chem., Tokyo Univ. Fish., Konan, Minato-ku, Tokyo 108, Japan]

79-003021 Koidsumi, K. [POLLUTION OF INLAND WATER WITH SPECIAL REFERENCE TO THE POLLUTION DUE TO EFFLUENTS FROM ELECTRO-PLATING.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 1: 93-102. 1972[1977]. In Japanese with English summ. SFA 24(4)
[Shinshu Univ., Ueda, Japan]

79-003022 Kraft, K. J. /PONTOPOREIA/ DISTRIBUTION ALONG THE KEWEENAW SHORE OF LAKE SUPERIOR AFFECTED BY COPPER TAILINGS. J. Great Lakes Res. 5 (1): 28-35. 1979. SFA 24(4)
[Dep. Biol. Sci., Mich. Technol. Univ., Houghton 49931] The sediment and benthic macroinvertebrates of a 540 km^2 area of Lake Superior were examined. The amphipod /Pontoporeia hoyi/ was by far the most abundant animal collected. a 42 km^2 area devoid of /P. hoyi/ was found near where 50 million tons of copper tailings containing metallic copper in concentrations averaging 3750 mg/kg had been dumped between 1895 and 1968. In the no-amphipod region sediment copper ranged from 395 to 1310 mg/kg, while elsewhere mean levels were 14 to 298 mg/kg. The study area was divided into five transects which had maximum densities of /P. hoyi/ ranging from 470 to 4480/m^2. The depth of maximum density ranged from 40-45 to 60-65 m. Maximum density was associated with a mean grain size of [negative log to the base 2 of grain diameter in mm] 3.5-4.0 and elevated levels of total volatile solids, nitrogen, phosphorus, and chemical oxygen demand. Copper and dark color, characteristics of the copper tailings, showed significant negative correlations with /P. hoyi/ density.

79-003023 Ogata, M.; Miyake, Y.; Yamasaki, Y. IDENTIFICATION OF SUBSTANCES TRANSFERRED TO FISH OR SHELLFISH FROM PETROLEUM SUSPENSION. Water Res. 13 (7): 613-618. 1979. SFA 24(4)
[Dep. Publ. Health, Okayama Univ. Med. Sch., 2-5-1 Shikata-Cho, Okayama City, Japan]

79-003024 Ott, W. R. WATER QUALITY INDICES: A SURVEY OF INDICES USED IN THE UNITED STATES. U.S. Environ. Prot. Agency Environ. Monit. Ser. EPA-600/4-78-005. x + 128p. Jan. 1978. SFA 24(4)
[U.S. EPA Monit. Technol. Div., Off. Monit. Tech. Support, Washington, DC 20460]

79-003025 Ottawa River Project Group MERCURY IN THE OTTAWA RIVER. Environ. Res. 19 (2): 231-243. Aug. 1979. SFA 24(4)
The Ottawa River Project, a 5-year study of the distribution and transport of mercury in a stretch of the Ottawa River, is summarized. Significant observations include the rapid clearance of mercury from the sediments (half-life on the order of 1 year), the utility of partition coefficients for the description of mercury distribution between sediment and water, the use of plants as indicators of inorganic and organic forms of mercury in water, and the general predictability of methylmercury levels in fish.

79-003026 Preston, E. M.; Lewis, R. A. , (eds.) THE BIOENVIRONMENTAL IMPACT OF A COAL-FIRED POWER PLANT. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-021. ix + 521p. Feb. 1978. SFA 24(4)
[U.S. EPA, Corvallis Environ. Res. Lab., Corvallis, OR 97330]

79-003027 Ramos, A.; de Campos, M.; Olszyna-Marzys, A. E. MERCURY CONTAMINATION OF FISH IN GUATEMALA. Bull. Environ. Contam. Toxicol. 22 (4/5): 488-493. July 1979. SFA 24(4)
[LUCA, Guatemala]

79-003028 Robinson-Wilson, E.; Boyle, T. P. THE ECOLOGICAL INERTIA OF THREE DIFFERENT KINDS OF AQUATIC COMMUNITIES IN EXPERIMENTAL PONDS. II. ANALYSIS OF RESPONSE OF ZOOPLANKTON AND FISH COMMUNITIES. Bull. Ecol. Soc. Am. 60 (2): 121-122. June 1979. Abstract only. SFA 24(4)
[U.S. FWS, Columbia Natl. Fish. Res. Lab., Columbia, MO] Ecological inertia was measured by analysis of zooplankton and fish populations in three different classes of aquatic communities perturbed by (1) a single heavy dose as opposed to (2) several light doses of an environmental contaminant. Rotifiers in net samples were greatly reduced by a single heavy treatment with pentachlorophenol (PCP), but multiple light PCP treatments did not reduce the number of rotifers. Higher numbers of benthic insects were caught in net samples in ponds treated with PCP. The insects in the multiple dose were higher than either the control or single dose. The single heavy does of PCP killed all of the fish in the planktonic ponds and reduced survival rates of all species of fish in the macrophyte ponds. Reproductive success of surviving fish was reduced in all of the ponds receiving a single heavy dose. In the multiple PCP treatment ponds, highest fish mortality occurred in the low nutrient phytoplankton ponds. Reproductive success of bass and bluegills was unaffected in the macrophyte ponds, but was greatly reduced in the high and low nutrient phytoplankton ponds. A Single heavy dose of PCP affected fish populations more than four lighter doses. Ponds dominated by macrophytes were not affected as much as ponds dominated by planktonic communities.

79-003029 Sanderson, M.; LaValle, P. D. SURFACE LOADING FROM POLLUTANTS IN PRECIPITATION IN SOUTHERN ONTARIO: SOME CLIMATIC AND STATISTICAL ASPECTS. J. Great Lakes Res. 5 (1): 52-60. 1979. SFA 24(4)
[Dep. Geogr., Univ. Windsor, Windsor, ON N9B 3P4, Canada]

79-003030 Schneider, R. W.; Smith, A. O.; Mitchell, V. P., Jr. CHARACTERISTICS OF SPORT FISHING ACTIVITY IN THREE WARM WATER DISCHARGES. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 546-554. 1977[1979]. SFA 24(4)
[Div. For. Fish. Wildl. Dev., TVA, Norris, TN 37828]

79-003031 Schneider, R. W.; Wilson, W. K.; Evenhuis, B. I. MIGRATION OF SAUGER PAST A THERMAL DISCHARGE IN MELTON HILL RESERVOIR. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 538-545. 1977[1979]. SFA 24(4)
[Div. For. Fish. Wildl. Dev., TVA, Norris, TN 37828] A Total of 259 sauger (/Stizostedion canadense/) was tagged and released downstream of Bull Run Steam Plant during the winters of 1974-75 and 1976. Gill nets and electrofishing gear were used to recapture sauger that moved into the discharge basin or past the plant. Over the study period 7 sauger were recaptured upstream from the discharge; 3 of these had moved past the plant while it was continuously operating. Fourteen sauger were caught in the discharge. The thermal plume from Bull Run Steam Plant had no significant effect on the movement of sauger.

79-003032 Skogerboe, R. K.; Lavallee, C. S.; Miller, M. M.; Dick, D. L. ENVIRONMENTAL EFFECTS OF WESTERN COAL SURFACE MINING. PART III--THE WATER QUALITY OF TROUT CREEK, COLORADO. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-79-008. x + 58p. Jan. 1979. SFA 24(4)
[Dep. Chem., Colo. State Univ., Fort Collins 80523] The impact of the mine spoil drainage on the stream is reflected in the larger quantities of dissolved solids and common ions found at on-stream sites adjacent to and below the mine. For trace elements, the mine operation has no detectable impact on Trout Creek in terms of increasing concentrations of Al, As, Cd, Cr, Cu, Fe, Pb, or Zn. Increases in stream concentrations of Mn and Se due to mine inflow can be inferred from the data. Higher concentrations of As, Fe, Mn, Se, and Zn are found in waters draining mine spoils. In the mine spoils, variations in the concentrations of these elements occur with spoil age; more Mn and Zn occur in older spoils, while higher levels of As, Fe, and Se are found in newer spoils. Chemical equilibrium calculations indicate that alkaline precipitation processes can maintain the low concentrations of Al, Cd, Cu, Fe, Pb, and Zn. The general alkaline characteristics of western streams and aquifers suggests that such precipitation equilibria will limit the soluble heavy metal concentrations.--From abstr.

79-003033 Soule, D. F.; Oguri, M. , (eds.) MARINE STUDIES OF SAN PEDRO BAY, CALIFORNIA. PART 15. THE IMPACT OF THE SANSINENA EXPLOSION AND BUNKER C SPILL ON THE MARINE ENVIRONMENT OF OUTER LOS ANGELES HARBOR. Inst. Mar. Coast. Stud. Univ. South. Calif., Los Angeles xii + 258p. Dec. 1978. SFA 24(4)

79-003034 Springer, S. A REVISION OF THE CATSHARKS, FAMILY SCYLIORHINIDAE. NOAA Tech. Rep. NMFS Circ. 422. v + 152p. Apr. 1979. SFA 24(4)
[Mote Mar. Lab., Sarasota, FL]

79-003035 Taylor, W. W.; Gerking, S. D. POTENTIAL OF THE OHRID RIFFLE MINNOW, /ALBURNOIDES BIPUNCTATUS OHRIDANUS/, AS AN INDICATOR OF POLLUTION. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2178-2181. 1978. SFA 24(4)
[Dep. Zool., Ariz. State Univ., Tempe 85281]

79-003036 Vaughan, G. L. EFFECTS OF STRIPMINING ON FISH AND DIATOMS IN STREAMS OF THE NEW RIVER DRAINAGE BASIN. J. Tenn. Acad. Sci. 54 (3): 110-114. July 1979. SFA 24(4)
[Univ. Tenn., Knoxville 37916] Contour mining for coal as has been practiced in the New River drainage basin of East Tennessee profoundly affects population size, species richness, and species equitability of aquatic organisms inhabiting streams draining the mined areas. Fish and diatom communities have been sampled over a three year period from four small watersheds, one undisturbed and three with strip mine activity. Diatom species diversity was significantly greater in the control stream where more than twice as many species of diatoms were found than in the mine-disturbed streams. /Semotilus atromaculatus/, the creek chub, composed 95-98 percent of the fish population in the mined basins. Darters were absent except in the control stream. The trend for both fish and diatoms was toward smaller populations and fewer species of less equitable distribution with increasing mine activity. Changes observed in community structure of organisms in these streams could not be explained by differences in water quality other than those related to increased runoff, sediment load, and

79-003036 CONTINUED
siltation caused by mining activity.

79-003037 Warlen, S. M. A RECURRENCE MODEL FOR THE PREDICTION OF DDT FLUX IN ATLANTIC MENHADEN. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 425-431. 1977[1979]. SFA 24(4)
[NMFS, Beaufort, NC 28516] A simple recurrence model is developed for the prediction of DDT flux through Atlantic menhaden (/Brevoortia tyrannus/). The DDT body burden in young-of-the-year menhaden at any time is equal to the body burden on the previous day plus the DDT accumulated on the current day minus the DDT turnover. Accumulation of DDT is simulated and compared with field observations. Estimations of DDT ingestion, assimilation, turnover, and egestion are made on both per fish and population bases. It is estimated that emigrating juvenile menhaden export 20 g DDT year^{-1} from the Newport River estuary in North Carolina.

TOXICOLOGY; BIOASSAYS

79-003038 Abram, F. S. H.; Wilson, P. THE ACUTE TOXICITY OF CS TO RAINBOW TROUT. Water Res. 13 (7): 631-635. 1979. SFA 24(4)
[Water Res. Cent., Elder Way, Stevenage, Herts. SG1 1TH, England]

79-003039 Addison, R. F.; Zinck, M. E.; Willis, D. E.; Darrow, D. C. INDUCTION OF HEPATIC MIXED FUNCTION OXIDASES IN TROUT BY POLYCHLORINATED BIPHENYLS AND BUTYLATED MONOCHLORODIPHENYL ETHERS. Toxicol. Appl. Pharmacol. 49 (2): 245-248. 30 June 1979. SFA 24(4)
[Bedford Inst. Oceanogr., Dartmouth, NS B2Y 4A2, Canada]

79-003040 Bansal, S. K.; Verma, S. R.; Gupta, A. K.; Dalela, R. C. PHYSIOLOGICAL DYSFUNCTION OF THE HAEMOPOIETIC SYSTEM IN A FRESH WATER TELEOST, /LABEO ROHITA/, FOLLOWING CHRONIC CHLORDANE EXPOSURE. PART II.--ALTERATIONS IN CERTAIN ORGANIC COMPONENTS AND SERUM ELECTROLYTES. Bull. Environ. Contam. Toxicol. 22 (4/5): 674-680. July 1979. SFA 24(4)
[Pollut. Relevant Res. Lab., Dep. Zool., D.A.V. Coll., Muzaffarnagar-251001, India]

79-003041 Bansal, S. K.; Verma, S. R.; Gupta, A. K.; Dalela, R. C. PHYSIOLOGICAL DYSFUNCTION OF THE HAEMOPOIETIC SYSTEM IN A FRESH WATER TELEOST, /LABEO ROHITA/, FOLLOWING CHRONIC CHLORDANE EXPOSURE. PART I.--ALTERATIONS IN CERTAIN HAEMATOLOGICAL PARAMETERS. Bull. Environ. Contam. Toxicol. 22 (4/5): 666-673. July 1979. SFA 24(4)
[Pollut. Relevant Res. Lab., Dep. Zool., D.A.V. Coll., Muzaffarnagar-251001, India]

79-003042 Blickens, E. A. M. CADMIUM INDUCED HISTOPATHOLOGICAL CHANGES IN THE GILLS OF THE BROWN BULLHEAD /ICTALURUS NEBULOSUS/ (LESUEUR). Ph.D. dissertation, N.Y. Univ. 158p. 1978. From Diss. Abstr. Int. B Sci. Eng. 39(12, part 1):5708. June 1979. SFA 24(4)

79-003043 Boudou, A.; Delarche, A.; Ribeyre, F.; Marty, R. BIOACCUMULATION AND BIOAMPLIFICATION OF MERCURY COMPOUNDS IN A SECOND LEVEL CONSUMER, /GAMBUSIA AFFINIS/--TEMPERATURE EFFECTS. Bull. Environ. Contam. Toxicol. 22 (6): 813-818. Aug. 1979. SFA 24(4)
[Lab. Ecol. Anim., Univ. Bordeaux I, Fac. Sci., 33405-Talence, France]

79-003044 Buikema, A. L., Jr.; McGinniss, M. J.; Cairns, J., Jr. PHENOLICS IN AQUATIC ECOSYSTEMS: A SELECTED REVIEW OF RECENT LITERATURE. Mar. Environ. Res. 2: 87-181. 1979. SFA 24(4)
[Cent. Environ. Stud., VPI&SU, Blacksburg, VA 24061]

79-003045 Burton, D. T.; Hall, L. W., Jr.; Margrey, S. L. CHLORINE, TEMPERATURE AND EXPOSURE DURATION INTERACTIONS ON EGGS AND PROLARVAE OF THE STRIPED BASS, /MORONE SAXATILIS/ (WALBAUM). ASB (Assoc. Southeast. Biol.) Bull. 26 (2): 89. Apr. 1979. SFA 24(4)
[Benedict Estuarine Mar. Lab., Benedict, MD] Chlorine, temperature and exposure duration interactions were established for eggs and prolarvae of /Morone saxatilis/ that may be exposed to various power plant operating conditions. The organisms were exposed to total residual chlorine concentrations up to 0.3 mg/l and delta T's to 10 C for exposure durations up to 4 h. After each exposure period, chlorine concentrations were decayed over a 2- to 4-h period to less than 0.01 mg/l. Temperatures were decayed over a 4-h period to 2 C above ambient. A percent mortality model for chlorine, delta T and exposure duration effects on eggs 36 h after exposure showed that: 1) the response to chlorine alone was much greater than a linear effect; 2) the resonse to both delta T and exposure duration alone was less than that of chlorine and 3) two-way linear interactions occurred between chlorine and exposure duration. The percent mortality model for prolarvae 24 h after exposure showed that 1) the response to chlorine alone was less than the linear response to delta T; 2) exposure duration alone was greater than a linear effect and 3) two-way interactions occurred between chlorine and delta T as well as delta T and exposure duration. Prolarvae were found to be more sensitive than eggs under the same test conditions.

79-003046 Cairns, J., Jr.; Dickson, K. L.; Maki, A. W. ESTIMATING THE HAZARD OF CHEMICAL SUBSTANCES TO AQUATIC LIFE. Hydrobiologia 64 (2): 157-166. 1 June 1979. SFA 24(4)
[Cent. Environ. Stud., VPI&SU, Blacksburg, VA 24061]

79-003047 Cardeilhac, P. T.; Simpson, C. F.; Lovelock, R. L.; Yosha, S. F.; Calderwood, H. W.; Gudat, J. C. FAILURE OF OSMOREGULATION WITH APPARENT POTASSIUM INTOXICATION IN MARINE TELEOSTS: A PRIMARY TOXIC EFFECT OF COPPER. Aquaculture 17 (3): 231-239. July 1979. SFA 24(4)
[Coll. Vet. Med., Box J-135, JHMHC, Univ. Fla., Gainesville 32610] Four sheepshead, /Archosargus probatocephalus/, weighing 665-980 g were exposed to toxic concentrations (8.5 p.p.m.) of cupric ion (copper) in sea water. Five stages of intoxication of increasing severity, based on behavior and posture, were designated as follows: lethargy; indifference; incoordination; moribundity; death. Serum, gills, liver, and kidneys were taken from fish at different stages of intoxication for examination. Kidneys were congested and swollen, the kidney wt/body wt index increasing up to 13.5 standard deviations (S.D.) over the mean control value. Gill lamellae from copper-poisoned fish were blunt and thickened, capillaries congested, and mucous cells dilated. Livers were similar to controls. Twenty-two clinical values were examined but only serum electrolytes and uric acid levels, liver

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and gill copper concentrations, kidney weights, and respiratory rates increased in poisoned fish by more than 5 S.D. over mean control values and correlated with the different stages of intoxication. Increased serum potassium, inorganic phosphate, and total intracellular ion values gave highest correlations with severity of intoxication. Potassium levels reached values considered lethal for mammals, and it was concluded that the intoxication following copper poisoning was a potassium intoxication caused primarily by cell damage and failure of osmoregulation by gills and kidneys.

79-003048 Carroll, J. J.; Ellis, S. J.; Oliver, W. S. INFLUENCES OF HARDNESS CONSTITUENTS ON THE ACUTE TOXICITY OF CADMIUM TO BROOK TROUT (/SALVELINUS FONTINALIS/). Bull. Environ. Contam. Toxicol. 22 (4/5): 575-581. July 1979. SFA 24(4)
[U.S. EPA, Off. Water Waste Manage., Washington, DC 20460] These data show that of the three major constituents characteristic of most hard waters (i.e., Ca^{2+}, Mg^{2+}, and the CO(2) system) calcium ion, introduced either as sulfate or carbonate, is the major source of protection against cadmium toxicity. This protective effect is observed in the absence of significant cadmium precipitation. Magnesium ion, sulfate ion, sodium ion and the carbonate system provide little or no protection.--Conclusion.

79-003049 Dubale, M. S.; Shah, P. TOXIC EFFECT OF CADMIUM NITRATE ON THE LIVER OF /CHANNA PUNCTATUS/. Experientia (Basel) 35 (5): 643-644. 15 May 1979. SFA 24(4)
[Zool. Dep., Univ. Sch. Sci., Gujarat Univ., Ahmedabod 380 009, India] Exposure of a fresh water fish, /Channa punctatus/, in a medium containing as low as 0.01 ppm of cadmium nitrate, resulted in the necrosis of hepatic cells. A temporary recovery of these cells was however observed when the animals were exposed to lower concentrations.

79-003050 Ducat, D. A.; Khan, M. A. Q. ABSORPTION AND ELIMINATION OF ^{14}C-/CIS/- CHLORDANE AND ^{14}C-PHOTO-/CIS/-CHLORDANE BY GOLDFISH /CARASSIUS AURATUS/. Arch. Environ. Contam. Toxicol. 8 (4): 409-417. 1979. SFA 24(4)
[Biol. Sci., Univ. Ill., Chicago 60680]

79-003051 Feroz, M.; Khan, M. A. Q. METABOLISM OF ^{14}C-HEPTACHLOR IN GOLDFISH (/CARASSIUS AURATUS/). Arch. Environ. Contam. Toxicol. 8 (5): 519-531. 1979. SFA 24(4)
[M. A. Q. Khan: Dep. Biol. Sci., Univ. Ill., Box 4348, Chicago, IL 60680]

79-003052 Fletcher, G. L.; Kiceniuk, J. W.; King, M. J.; Payne, J. F. REDUCTION OF BLOOD PLASMA COPPER CONCENTRATIONS IN A MARINE FISH FOLLOWING A SIX MONTH EXPOSURE TO CRUDE OIL. Bull. Environ. Contam. Toxicol. 22 (4/5): 548-551. July 1979. SFA 24(4)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1C 5S7, Canada]

79-003053 Gelman, A.; Herzberg, A. A FIELD METHOD TO CERTIFY WHETHER FISH DIED FROM POISONING BY ACETYLCHOLINESTERASE INHIBITION. Bamidgeh 31 (1): 18-20. Mar. 1979. SFA 24(4)
[Fish. Technol. Unit, Dep. Fish., Minist. Agric., Haifa, P.O.B. 699, Israel]

79-003054 Giesy, J. P., Jr.; Kania, H. J.; Bowling, J. W.; Knight, R. L.; Mashburn, S.; Clarkin, S. FATE AND BIOLOGICAL EFFECTS OF CADMIUM INTRODUCED INTO CHANNEL MICROCOSMS. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-79-039. xv + 157p. Apr. 1979. SFA 24(4)
[Savannah River Ecol. Lab., Univ. Ga., Drawer E, Aiken SC 29801]

79-003055 Gilderhus, P. A. EFFECTS OF GRANULAR 2',5-DICHLORO-4'-NITROSALICYLANILIDE (BAYER 73) ON BENTHIC MACROINVERTEBRATES IN A LAKE ENVIRONMENT. Great Lakes Fish Comm. Tech. Rep. No. 34. p. 1-5. May 1979. SFA 24(4)
[U.S. FWS, P.O. Box 818, La Crosse, WI 54601] Benthic organisms were collected before, and during the first 13 days after, treatment of a selected area of a lake with granular Bayer 73 for control of larval sea lamprey (/Petromyzon marinus/) to determine the effects of the treatment on invertebrates. Total numbers of organisms in the treated area dropped 56 percent in the first 7 days after treatment. Most of the reduction occurred among oligochaetes and midge larvae. Numbers of mayfly nymphs and amphipods were not substantially affected. Total numbers of organisms and numbers of oligochaetes and midge larvae increased between 7 and 13 days after treatment. Judging from this study, treatments with Bayer 73 are expected to have only moderate effects of short duration on populations of macroinvertebrates.

79-003056 Grande, M.; Andersen, S. VIRKNING AV KADMIUM PA LAKSEFISK. [THE EFFECT OF CADMIUM ON ATLANTIC SALMON (/SALMO SALAR/ L.).] Nor. Inst. Vannforsk. 1978: 21-26. 1979. In Norwegian with English summ. SFA 24(4)
[Norsk Inst. Vannforskning, Oslo, Norway] Eggs, alevins and yearlings of Atlantic salmon (/Salmo salar/ L.) were exposed to several concentrations of cadmium (1-1000 ug Cd/l) for 4 1/2 months. There was complete mortality in concentrations of 5 ug Cd/l and higher, while there was no significant mortality in 1 ug Cd/l. According to this partial life cycle test the maximum acceptable toxicant concentration (MATC) for Atlantic salmon exposed to cadmium in soft freshwater (pH 6.3 hardness 13 mg CaCO(3)/l) may lie between 1 and 5 ug Cd/l, probably nearer to the first value.

79-003057 Hattula, M. L.; Reunanen, H.; Wasenius, V.-M.; Krees, R.; Arstila, A. U. TOXICITY OF 4-CHLORO-O-CRESOL TO FISH. LIGHT MICROSCOPY AND CHEMICAL ANALYSIS OF THE TISSUE. Bull. Environ. Contam. Toxicol. 22 (4/5): 508-511. July 1979. SFA 24(4)
[Dep. Chem., Univ. Jyvaskyla, SF-40100 Jyvaskyla, Finland]

79-003058 Hillaby, B. A.; Randall, D. J. ACUTE AMMONIA TOXICITY AND AMMONIA EXCRETION IN RAINBOW TROUT (/SALMO GAIRDNERI/). J. Fish. Res. Board Can. 36 (6): 621-629. June 1979. In English with French summ. SFA 24(4)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

79-003059 Hiraoka, Y.; Nakagawa, H.; Murachi, S. BLOOD PROPERTIES OF RAINBOW TROUT IN ACUTE HEPATOTOXITY BY CARBON TETRACHLORIDE. Bull. Jpn. Soc. Sci. Fish. 45 (4): 527-532. Apr. 1979. SFA 24(4)
[Dep. Hygiene, Sch. Med., Hiroshima Univ., Hiroshima, Japan]

79-003060 Hodson, P. V.; Blunt, B. R.; Jensen, D.; Morgan, S. EFFECT OF FISH AGE ON PREDICTED AND OBSERVED CHRONIC TOXICITY OF LEAD TO RAINBOW TROUT IN LAKE ONTARIO WATER. J. Great Lakes Res. 5 (1): 84-89. 1979. SFA 24(4)
[Great Lakes Biolimnol. Lab., Can. Cent. Inland Waters, 867 Lakeshore Rd., P.O. Box 5050, Burlington, ON L7R 4A6, Canada]
Exposure of rainbow trout (/Salmo gairdneri/) starting at the egg stage to water-borne lead in Lake Ontario water (hardness of 135 mg CaCO(3)/L) resulted in black tails (early symptoms of spinal deformities) at lead concentrations as low as 22 ug/L. No black tails were observed at 11 ug/L. Previous publications demonstrated that the lowest lead concentration causing black tails in trout exposed from fingerling stage in Lake Ontario water was 120 ug/L, suggesting that fish exposed from the egg stage are 5 times as sensitive as those exposed from the fingerling stage. Compared to previously published data on fish exposed from the egg stage, blood lead of fish exposed from the egg stage was greater for a similar lead exposure. However, the relationship between blood lead and enzyme inhibition (erthrocyte gamma-amino levulinic adid dehydratase) was unchanged. Therefore the increased sensitivity of trout exposed from the egg stage was probably due to enhanced lead accumulation rather than to an enhanced response to the lead taken up. The incidence of black tails at this hardness corresponded well to a prediction based on published lead toxicity at extremes of water hardness.

79-003061 Holcombe, G. W.; Andrew, R. W. THE ACUTE TOXICITY OF ZINC TO RAINBOW AND BROOK TROUT. COMPARISONS IN HARD AND SOFT WATER. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-094. vii + 17p. Oct. 1978. SFA 24(4)
[U.S.EPA, Environ. Res. Lab., Duluth, MN 55804] The means and ranges of the 96-hour LC50's derived from three tests were 0.55 (0.37 to 0.76) and 2.5 (1.9 to 3.0) mg Zn/liter for rainbow and 2.0 (1.6 to 2.4) and 6.0 (5.0 to 7.0) mg Zn/liter for brook trout in soft and hard water, respectively. Based on overall means, brook trout were approximately 2.7 times more resistant than rainbow trout. Zinc toxicity to both species increased with increasing pH, and decreased with increasing hardness and alkalinity.

79-003062 Horning, W. B.; Neiheisel, T. W. CHRONIC EFFECT OF COPPER ON THE BLUNTNOSE MINNOW, /PIMEPHALES NOTATUS/ (RAFINESQUE). Arch. Environ. Contam. Toxicol. 8 (5): 545-552. 1979. SFA 24(4)
[U.S. EPA, Newtown Fish Toxicol. Stn., Cincinnati, OH 45244]

79-003063 Hughes, G. M.; Perry, S. F.; Brown, V. M. A MORPHOMETRIC STUDY OF EFFECTS OF NICKEL, CHROMIUM AND CADMIUM ON THE SECONDARY LAMELLAE OF RAINBOW TROUT GILLS. Water Res. 13 (7): 665-679. 1979. SFA 24(4)
[Res. Unit Comp. Anim. Respir., Univ. Bristol, Woodland Rd., Bristol BS8 1UG, England]

79-003064 Hutchins, F. E. TOXICITY OF PULP AND PAPER MILL EFFLUENT. A LITERATURE REVIEW. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-79-013. vi + 44p. Feb. 1979. SFA 24(4)
[U.S. EPA, Corvallis Environ. Res. Lab., Corvallis, OR 97330] Untreated pulp and paper mill effluents are very toxic to most aquatic life. Concentrations as low as two percent can be acutely toxic to fish. Sufficient treatment can render the effluent essentially nontoxic much of the time; however, treatment processes used by most mills reduce toxicity but do not eliminate it. Even effluents receiving "good" treatment may exhibit sporadic and dynamic increases in toxicity (due in part to spills or dumping of spent pulping chemicals). Sublethal exposures to aquatic organisms to pulp effluent may affect a number of their physiological and behavioral functions. The more sensitive functions, growth rate, coughing reflex, and temperature tolerance, are affected at concentrations less than 1/10th of the 96-hr LC50. Many other systems such as respiration and circulation may be affected at concentrations near 1/10th of 96-hr LC50. The principal toxic components in pulp and paper mill effluents are resin acids and fatty acids naturally occurring in the wood pulp and, in effluents from bleaching processes, toxic chlorinated compounds predominate. Untreated effluents have caused considerable environmental damage, but well-treated effluents have had minimal effects on fish production, although shifts in biological diversity have occurred.--From abstr.

79-003065 Johansson-Sjobeck, M.-L.; Larsson, A. EFFECTS OF INORGANIC LEAD ON DELTA-AMINOLEVULINIC ACID DEHYDRATASE ACTIVITY AND HEMATOLOGICAL VARIABLES IN THE RAINBOW TROUT, /SALMO GAIRDNERII/. Arch. Environ. Contam. Toxicol. 8 (4): 419-431. 1979. SFA 24(4)
[A. Larsson: Natl. Environ. Prot. Board, Brackish Water Toxicol. Lab., Studsvik, Fack, S-611 82 Nykoping, Sweden]

79-003066 Jozuka, K.; Adachi, H. ENVIRONMENTAL PHYSIOLOGY ON THE PH TOLERANCE OF TELEOST. II. BLOOD PROPERTIES OF MEDAKA, /ORYZIAS LATIPES/, EXPOSED TO LOW PH ENVIRONMENT. Annot. Zool. Jpn. 52 (2): 107-113. June 1979. SFA 24(4)
[Dep. Biol., Coll. Liberal Arts, Kanazawa Univ., Kanazawa, Ishikawa 920, Japan] The changes of blood pH and plasma sodium concentration of the medaka, /Oryzias latipes/, exposed to acidic environment (H(2) SO(4)) were examined with reference to the mechanism of acid tolerance. In fish exposed to low pH environment (pH 4.0) for 4 hours, blood pH was dropped from 7.34 to 6.99, and plasma Na concentration markedly decreased from 110.5 to 66.4 mEq/L in the mean. When Ca ion was present at the concentration of 30 mM, plasma Na level maintained the normal level even at low pH. In saline water (200 mM NaCl), plasma Na level rapidly increased; the increasing rate at control pH (5.5) was definitely higher than that at pH 4.0. From these results the mechanism of low pH tolerance of fish was discussed in relation to the Na balance in body fluid and the branchial permeability.

79-003067 Kaiser, I. I.; Young, P. A.; Johnson, J. D. CHRONIC EXPOSURE OF TROUT TO WATERS WITH NATURALLY HIGH SELENIUM LEVELS: EFFECTS ON TRANSFER RNA METHYLATION. J. Fish. Res. Board Can. 36 (6): 689-694. June 1979. SFA 24(4)
[Dep. Biochem., Univ. Wyo., Laramie 82071]

79-003068 Koyama, J.; Fujita, M.; Itazawa, Y. [EFFECTS OF ORAL ADMINISTRATION OF CADMIUM ON FISH--IV. EFFECTS ON ULTRASTRUCTURES OF HEPATIC AND RENAL CELLS OF THE CARP AND THE PORGY.] Bull. Jpn. soc. Sci. Fish. 45 (4): 429-436. Apr. 1979. In Japanese with English summ. SFA 24(4)
[Dep. Fish., Fac. Agric., Kyushu Univ. 46-04, Hakozaki, Higashi-ku, Fukuoka 812, Japan] Carp (/Cyprinus carpio/) of 258 ± 37 g were fed for 30 days (0, 140 and 1700 ppm) or 14 days (5700 ppm) on feed containing Cd of 0, 140, 1700 or 5700 ppm in the dry weight. Porgy (/Pagrus major/) of 73 ± 7 g were fed for 113 days on feed containing Cd of 0, 37.5, 150 or 375 ppm in the dry weight. In the hepatic cells of both fishes fed on Cd-containing feed, the most remarkable alterations were increase and enlargement of lysosomes with the increase of Cd content in feed. Decrease of glycogen granules (carp and porgy), increase and dilation of smooth-surfaced endoplasmic reticulum (carp), and increase of rough-surfaced endoplasmic reticulum (porgy) were noticed in the hepatic cells of Cd-administered fish. In the epithelial cells of the proximal segment of renal tubule of both fishes fed on Cd-containing feed, the most remarkable alterations were increase and enlargement of lysosomes and apical vacuoles, increase of coated vesicles and apical tubules, and dilation of smooth-surfaced endoplasmic reticulum. These ultrastructural alterations in the liver and kidney are considered to be the effects of ingested Cd, and to imply functional disorders of both organs.

79-003069 Koyama, J.; Itazawa, Y. [EFFECTS OF ORAL ADMINISTRATION OF CADMIUM ON FISH--V. EFFECTS ON CALCIUM AND INORGANIC PHOSPHORUS EXCRETION IN THE CARP.] Bull. Jpn. Soc. Sci. Fish. 45 (6): 691-694. June 1979. In Japanese with English summ. SFA 24(4)
[Dep. Fish., Fac. Agric., Kyushu Univ., 46-04, Hakozaki, Higashi-ku, Fukuoka 812, Japan]

79-003070 Larson, G. L.; Warren, C. E.; Hutchins, F. E.; Lamperti, L. P.; Schlesinger, D. A.; Seim, W. K. TOXICITY OF RESIDUAL CHLORINE COMPOUNDS TO AQUATIC ORGANISMS. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-023. xiii + 105p. Mar. 1978. SFA 24(4)
[Dep. Fish. Wildl., Oak Creek Lab. Biol., Oreg. State Univ., Corvallis 97331]

79-003071 Lemke, A. E.; Brungs, W. A.; Halligan, B. J. MANUAL FOR CONSTRUCTION AND OPERATION OF TOXICITY-TESTING PROPORTIONAL DILUTERS. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-072. viii + 70p. July 1978. SFA 24(4)
[US.EPA, Environ. Res. Lab., Duluth, MN 55804]

79-003072 Levitan, W. M.; Taylor, M. H. PHYSIOLOGY OF SALINITY-DEPENDENT NAPHTHALENE TOXICITY IN /FUNDULUS HETEROCLITUS/. J. Fish. Res. Board Can. 36 (6): 615-620. June 1979. In English with French summ. SFA 24(4)
[Dames & Moore, Suite 700, 7101 Wisconsin Ave., Washington, DC 20014]

79-003073 Liden, L. H.; Burton, D. T.; Margrey, S. L.; Bongers, L. H. COMPARATIVE BIOTOXICITY OF BROMOCHLORINATED AND CHLORINATED POWER PLANT CONDENSER COOLING WATERS TO SELECTED ESTUARINE ORGANISMS. ASB (Assoc. Southeast. Biol.) Bull. 26 (2): 88. Apr. 1979. SFA 24(4)
[Benedict Estuarine Mar. Lab, Benedict, MD] Juvenile spot and Atlantic menhaden showed no significant mortality after 20- and 19-day continuous exposures to the halogenated effluents, respectively.--From abstr.

79-003074 Maki, A. W.; Bishop, W. E. ACUTE TOXICITY STUDIES OF SURFACTANTS TO /DAPHNIA MAGNA/ AND /DAPHNIA PULEX/. Arch. Environ. Contam. Toxicol. 8 (5): 599-612. 1979. SFA 24(4)
[Procter & Gamble Co., Ivorydale Tech. Cent., Cincinnnati, OH 45217]

79-003075 Margrey, S. L.; Hall, L. W., Jr.; Burton, D. T. COMBINED EFFECTS OF CHLORINE, TEMPERATURE AND EXPOSURE DURATION ON LARVAL WHITE PERCH, /MORONE AMERICANA/ (GMELIN). ASB (Assoc. Southeast. Biol.) Bull. 26 (2): 88. Apr. 1979. SFA 24(4)
[Benedict Estuarine Mar. Lab., Benedict, MD] Chlorine-temperature interaction studies with various exposure times were conducted on 25-day old larval /Morone americana/ using total residual chlorine (TRC) concentrations of 0.0, 0.15 and 0.30 mg/l TRC in combination with delta T's of 2, 6 and 10 C above a base temperature of 18 C. Larval fish were exposed to the chlorine-temperature test conditions for exposure periods of 0.08, 2.0 and 4.0 h. After each respective exposure period, chlorine concentrations were decayed over a 2- to 4-h period to less than 0.01 mg/l TRC and temperatures were decayed over a 4-h period to 2 C above the base temperature. These test conditions were used to simulate chlorine and temperature conditions encountered in power plant discharge canals and near-field receiving streams. The interactions of chlorine, delta T and exposure duration as factors which caused death up to 36 h after the exposure periods were established by regression model techniques. An initial interaction model showed that delta T was not a factor which contributed to death. A predictive model for chlorine and exposure duration was constructed which showed that potential impact to larval white perch from chlorine at power facilities with once-through cooling systems can be minimized by 1) using short duration exposures to chlorine in plants that chlorinate intermittently or 2) by rapid mixing in the receiving stream in plants that chlorinate on a low level continuous basis.

79-003076 Martin, J. H. BIOACCUMULATION OF HEAVY METALS BY LITTORAL AND PELAGIC MARINE ORGANISMS. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-79-038. v + 57p. Mar. 1979. SFA 24(4)
[Moss Landing Mar. Lab., Moss Landing, CA 95039]

79-003077 McCraren, J. P.; Phillips, T. R. EFFECTS OF MASOTEN (DYLOX) ON PLANKTON IN EARTHEN PONDS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 441-448. 1977[1979]. SFA 24(4)
[U.S. FWS, Fish Cult. Dev. Cent., San Marcos, TX 78666] The effects of Masoten, an organophosphate parasiticide, on phytoplankton and zooplankton in earthen ponds were studied. In 2 separate trials, 3 ponds (0.04 ha) received a single application of Masoten at a rate of 0.25 mg/l (active ingredient) and 3 ponds served as untreated controls. Net plankton samples were collected at pretreatment, and 5, 24 and 48 hrs following treatment. Toxic effects were based on quantitative-qualitative plankton analyses. Phytoplankton and rotifers were unaffected by treatment. The copepod /Diaptomus/ sp. and nauplii were also unaffected. However, variability in response of copepods and nauplii to Masoten can be anticipated. Cladocerans were the most sensitive to Masoten; losses are to be expected when the compound is employed for control purposes. Information regarding residues and decomposition of Masoten is presented.

79-003078 Mishra, S.; Srivastava, A. K. HEMATOLOGY AS INDEX OF SUBLETHAL TOXICITY OF ZINC IN A FRESHWATER TELEOST. Bull. Environ. Contam. Toxicol. 22 (4/5): 695-698. July 1979. SFA 24(4)
[Dep. Zool., Univ. Gorakhpur, Gorakhpur 273 001, U.P., India]

79-003079 Mong, S. J.; Berra, T. M. THE EFFECTS OF INCREASING DOSAGES OF X-RADIATION ON THE CHROMOSOMES OF THE CENTRAL MUDMINNOW, /UMBRA LIMI/ (KIRTLAND) (SALMONIFORMES: UMBRIDAE). J. Fish Biol. 14 (6): 523-527. June 1979. SFA 24(4)
[Dep. Zool., Ohio State Univ., Mansfield 44906] Fish subjected to 350 R, 660 R and 990 R of X-radiation showed chromosomal aberrations such as chromatid breaks and gaps, and chromatid exchanges between several chromosomes. The frequency of aberrations/metaphase increased with radiation dosage. Likewise, the percentage of aberrant cells increased with increased irradiation. The Countable metaphases/fish was lower for higher doses of radiation. At lower doses single chromatid breaks accounted for most of the aberrations whereas complex aberrations involving the breakage and exchange of fragments between several chromosomes were more frequent in fish subjected to 990 R. Gill tissue yielded three times as many countable metaphases as did spleen tissue.

79-003080 Moore, M. R.; Meredith, P. A. THE CARCINOGENICITY OF LEAD. Arch. Toxicol. 42 (2): 87-94. June 1979. SFA 24(4)
[Dep. Med., Gardiner Inst. Med., Univ. Glasgow, G11 6NT, Scotland]

79-003081 Nichols, D. E.; Sellers, C. M., Jr. THE EFFECT OF PULSED CHLORINE ON THE VENTILATORY ACTIVITY OF RAINBOW TROUT (/SALMO GAIRDNERI/). Va. J. Sci. 29 (2): 66. 1978. Abstract only. SFA 24(4)
[Dep. Biol., James Madison Univ., Harrisonburg, VA 22801] Despite voluminous research, chlorine remains the only practical disinfectant for large quantities of water, even though chlorine compounds have been implicated as potential health hazards. Past experimentation on the effects of chlorine on aquatic life has dealt primarily with continuous exposure to chlorine. Even though there is a wide distribution of power plants, which have been in operation for many years, there is little data on the effects of intermittent chlorination to aquatic life. Pulses of chlorine that are passed into receiving waters from power plants are of particular interst to this study, since fish are a major portion of the aquatic life affected by these chlorine pulses. Using a direct volume determination technique,

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the effect of a single pulse of chlorine on the ventilatory activity of rainbow trout was investigated. At maximum chlorine concentrations of 0.2 and 0.4 mg 1^{-1}, ventilatory rate/volume and coughing were all found to increase. No significant difference was found between the fish exposed to 0.2 and 0.4 mg 1^{-1} chlorine for any of the three parameters studied. A negative correlation was found to exist between ventilatory rate and ventilatory volume.

79-003082 Nomura, T.; Shimizu, I. [STUDIES ON THE EFFECT OF BATHING DRUGS TO SALMONID FISHES--I. BATHING TOXICITY OF NIFUPIRINOL TO CHUM SALMON AND KOKANEE FRY.] Sci. Rep. Hokkaido Salmon Hatchery No. 33. p. 17-23. Mar. 1979. In Japanese with English summ. SFA 24(4)
[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiraku, Sapporo, Hokkaido, Japan]

79-003083 Peltier, W. METHODS FOR MEASURING THE ACUTE TOXICITY OF EFFLUENTS TO AQUATIC ORGANISMS. U.S. Environ. Prot. Agency Environ. Monit. Ser. EPA-600/4-78-012. ix + 52p. Jan. 1978. SFA 24(4)
[U.S. EPA, Environ. Res. Lab., Athens, GA 30601] This report describes methods for the measurement of the acute toxicity of effluents to macroinvertebrates and fish. The methods include a preliminary short-term (8-24 hr.), range-finding test and a long term (96 hr.), flow-through (or alternate static) definitive test for use in determining the LC50 or EC50 of the effluent. The report includes guidelines on effluent sampling and holding, facilities and equipment, dilution water, test species selection and handling, and data interpretation.

79-003084 Phillips, G. R.; Russo, R. C. METAL BIOACCUMULATION IN FISHES AND AQUATIC INVERTEBRATES: A LITERATURE REVIEW. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-103. vi + 116p. Dec. 1978. SFA 24(4)
[Fish. Bioassay Lab., Mont. State Univ., Bozeman 59717]

79-003085 Pierce, R. H., Jr. FATE AND IMPACT OF PENTACHLOROPHENOL IN A FRESHWATER ECOSYSTEM. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-063. xi + 62p. July 1978. SFA 24(4)
[Inst. Environ. Sci., Univ. South. Miss., Hattiesburg 39401]

79-003086 Rao, K. S.; Dad, N. K. STUDIES OF HERBICIDE TOXICITY IN SOME FRESHWATER FISHES AND ECTOPROCTA. J. Fish Biol. 14 (6): 517-522. June 1979. SFA 24(4)
[Sch. Stud. Zool., Vikram Univ., Ujjain, 456010, M.P., India] The results of studies on herbicide toxicity to fish and freshwater Ectoprocta are reported. The effects of herbicides, /viz/, Tafazine, Bladex, Aresin and Dalapon were studied on /Sarotherodon mossambicus/, /Puntius ticto/, /Cirrhinus mrigala/, /Danio/ sps., /Heteropneustes fossilis/, and /Channa punctatus/. /S. mossambicus/ was more susceptible to Tafazine toxicity. /Danio/ sps., was more resistant to Tafazine than /S. mossambicus/, but /P. ticto/ had the maximum tolerance. /S. mossambicus/ had greater resistance to Bladex than /C. mrigala/. /C. punctatus/ was resistant to Aresin toxicity. Herbicide toxicity to freshwater Ectoprocta was noted with reference to Planavin, Bladex, Tafazine, and 2,4-D butyl ester and mixtures of Planavin + Mercuric chloride and Planavin + Bladex. Herbicide toxicity effected the leptoblasts of /Plumatella casmiana/ and spinoblasts of /Lophopodella carteri/.

79-003087 Richey, D. ACUTE TOXICITY OF COPPER TO SOME FISHES IN HIGH ALKALINITY WATER. Ill. State Water Surv. Circ. 131. 24p. 1978. SFA 24(4)

[Ill. State Water Surv., Urbana] Bluegill and channel catfish were subjected to varying concentrations of copper in waters relatively high in alkalinity and salts of calcium and magnesium. Because of high alkalinity and pH of the dilution water, much of the copper precipitated. Copper complexes also occurred in the soluble copper, reducing the cupric ion concentration. Acute toxicity curves were developed for each species permitting assessment for 14-day TL50. The 14-day TL50 at 24°C was 2.5 mg/l soluble copper for 0.5 gram bluegill and 3.7 mg/l soluble copper for 1.5 gram bluegill. In the case of the channel catfish, apparently the more sensitive species to copper, the 14-day TL50 at 22.0°C was 1.2 mg/l soluble copper. For the protection of the fishes investigated and in conjugation with the water pollution regulation of Illinois, the soluble copper levels in Illinois streams having water characteristics similar to that of the dilution water used should not exceed 0.12 mg/l.

79-003088 Ruby, S. M.; Dixon, D. G.; Leduc, G. INHIBITION OF SPERMATOGENESIS IN RAINBOW TROUT DURING CHRONIC CYANIDE POISONING. Arch. Environ. Contam. Toxicol. 8 (5): 533-544. 1979. SFA 24(4)

[Dep. Biol. Sci., Sir George Williams Campus, Concordia Univ., Montreal, PQ H3G 1M8, Canada]

79-003089 Sastry, K. V.; Gupta, P. K. THE EFFECT OF CADMIUM ON THE DIGESTIVE SYSTEM OF THE TELEOST FISH, /HETEROPNEUSTES FOSSILIS/. Environ. Res. 19 (2): 221-230. Aug. 1979. SFA 24(4)

[Sch. Environ. Contam. Toxicol., Dep. Zool., D.A.V. Coll., Muzaffarnagar, India]

79-003090 Sastry, K. V.; Malik, P. V. STUDIES ON THE EFFECT OF DIMECRON ON THE DIGESTIVE SYSTEM OF A FRESH WATER FISH, /CHANNA PUNCTATUS/. Arch. Environ. Contam. Toxicol. 8 (4): 397-407. 1979. SFA 24(4)

[606/1C Civil Lines South, Muzaffarnagar-251 001 India]

79-003091 Saxena, R.; Tyagi, A. P. EFFECT OF MERCURIC CHLORIDE ON THE PHOSPHATASES IN THE ACCESSORY RESPIRATORY ORGANS OF /CLARIAS BATRACHUS/. Hydrobiologia 63 (3): 209-211. 27 Apr. 1979. SFA 24(4)

[Dep. Zool., D.A.V. (P.G.) Coll., Muzaffarnagar, India] /Clarias batrachus/, an air breathing fish, when exposed to the mercuric chloride, shows enhanced activity of alkaline phosphatase in its dendritic organs. However, an inhibiting effect has been observed on the activity of acid phosphatase.

79-003092 Smith, L. L., Jr.; Broderius, S. J.; Oseid, D. M.; Kimball, G. L.; Koenst, W. M.; Lind, D. T. ACUTE AND CHRONIC TOXICITY OF HCN TO FISH AND INVERTEBRATES. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-79-009. xiv + 115p. Jan. 1979. SFA 24(4)

[Dep. Entomol. Fish. Wildl., Univ. Minn., St. Paul 55108] The acute toxicity of HCN was determined at various temperatures and dissolved oxygen concentrations for different life history stages of seven species of fish and two species of invertebrates. Eggs were the most tolerant stage while fry and juvenile fish, the least tolerant stages, had similar sensitivities. Temperature and dissolved oxygen concentration (DO) also have an effect on acute toxicity; juvenile

79-003092 CONTINUED
fish generally became more sensitive with decreasing temperature and DO. In contrast to juvenile fish, invertebrates were less sensitive to HCN with decreasing temperature. One species of invertebrate had about the same sensitivity to HCN as juvenile fish, while the other species was considerably more tolerant of HCN. Long-term tests conducted with fathead minnows demonstrated that the concentrations of HCN having no adverse effect on egg production was between 12.9 and 19.6 ug/l. Chronic tests with brook trout demonstrated that on the basis of spawning success the maximum acceptable toxicant concentration (MATC) was between 5.7 and 11.2 ug/l HCN. When compared with the mean number of eggs spawned in the less productive of two controls, a 42.0 percent reduction was observed at the latter concentration. Long-term tests with bluegills showed that no spawning occurred at HCN concentrations as low as 5.2 ug/l. The survival of bluegill fry was drastically reduced at 19.4 ug/l HCN in 57-day tests which began with eggs. The Presence of sublethal concentrations of HCN caused increased predation by green sunfish on fathead minnows, but it was not determined whether fatheads were easier prey or the green sunfish had greater appetites.--From abstr.

79-003093 Stauffer, T. M. EFFECTS OF DDT AND PCB'S ON SURVIVAL OF LAKE TROUT EGGS AND FRY IN A HATCHERY AND IN LAKE MICHIGAN, 1973-1976. Trans. Am. Fish. Soc. 108 (2): 178-186. Mar. 1979. SFA 24(4)
[Mich. Dep. Nat. Resour., Marquette Fish. Res. Stn., Marquette 49855]

79-003094 Steele, J. A.; Courtois, L. A. HEMATOLOGICAL STRESS RESPONSE OF RAINBOW TROUT, /SALMO GAIRDNERI/, TO A SIMULATED GEOTHERMAL STEAM CONDENSATE SPILL. Calif. Fish Game 65 (3): 166-167. July 1979. SFA 24(4)
[Calif. Dep. Fish Game, Inland Fish. Br., Sacramento 95819]

79-003095 Tracor Jitco, Inc. QUALITY ASSURANCE GUIDELINES FOR BIOLOGICAL TESTING. U.S. Environ. Prot. Agency Environ. Monit. Ser. EPA-600/4-78-043. 600p. Aug. 1978. SFA 24(4)
[Rockville, MD 20852]

79-003096 Tsai, C.-F.; Welch, J.; Chang, K.-Y.; Shaeffer, J.; Cronin, L. E. BIOASSAY OF BALTIMORE HARBOR SEDIMENTS. Estuaries 2 (3): 141-153. Sept. 1979. SFA 24(4)
[Cent. Environ. Estuarine Stud., Univ. Md., Chesapeake Biol. Lab., Solomons, MD 20688]

79-003097 Verma, S. R.; Bansal, S. K.; Gupta, A. K.; Dalela, R. C. PESTICIDE INDUCED HAEMATOLOGICAL ALTERATIONS IN A FRESH WATER FISH /SACCOBRANCHUS FOSSILIS/. Bull. Environ. Contam. Toxicol. 22 (4/5): 467-474. July 1979. SFA 24(4)
[Pollut. Relevant Res. Lab., Dep. Zool., D.A.V. Coll., Muzaffarnagar-251001, India]

79-003098 Wedemeyer, G. A.; Nelson, N. C.; Yasutake, W. T. PHYSIOLOGICAL AND BIOCHEMICAL ASPECTS OF OZONE TOXICITY TO RAINBOW TROUT (/SALMO GAIRDNERI/). J. Fish. Res. Board Can. 36 (6): 605-614. June 1979. In English with French summ. SFA 24(4)
[U.S. FWS, Natl. Fish. Res. Cent., Bldg. 204, Naval Support Activity, Seattle, WA 98115]

FISH TOXICANTS

79-003099 Gilderhus, P. A. EFFICACY OF ANTIMYCIN FOR CONTROL OF LARVAL SEA LAMPREYS (/PETROMYZON MARINUS/) IN LENTIC HABITATS. Great Lakes Fish Comm. Tech. Rep. No. 34. p. 6-17. May 1979. SFA 24(4)
[U.S. FWS, P.O. Box 818, La Crosse, WI 54601] Antimycin, in a delayed-release granular formulation, was shown to be effective for control of larval sea lampreys (/Petromyzon marinus/) in lentic habitats at treatment rates of 75 to 150 g of active ingredient per hectare. When the chemical was tested in four inland lakes connected to the Great Lakes and known to harbor larval lampreys, about 90 percent or more of the larval lampreys present were killed by treatments of 150 g/ha (active ingredient). Treatment at 75 g/ha killed more than 90 percent in warm water but only 66 percent in cold water. Some small fish, mostly bottom-dwelling forms, were killed by the treatments.

79-003100 Wilson, J. H.; Masnik, M. T. POSSIBLE IMPLICATION OF TOXAPHENE AS A CAUSATIVE AGENT FOR LARVAL FISH ABNORMALITIES IN A SOUTH-CENTRAL RESERVOIR. Va. J. Sci. 29 (2): 71. 1978. Abstract only. SFA 24(4)
[U.S. Nuclear Regulatory Comm., Washington, DC 20555] Larval fish collected during the summers of 1975, 1976 and 1977 from Dardanelle Reservoir on the Arkansas River in Arkansas have exhibited three distinct kinds of abnormalities. As many as 50 percent of the collections from some areas of the reservoir have contained specimens of larval fish from six different families which exhibit one or more of the abnormalities recorded. Evidence will be presented indicating that toxaphene, a chlorinated hydrocarbon used to control agricultural pests on cotton and soybeans, may be responsible. The incidence of abnormalities among populations of larval fish in the reservoir seems to be declining, probably as a result of reduced usage of toxaphene in the watershed.

RESEARCH AND MANAGEMENT-GENERAL

79-003101 Bishop, R. C. FISH AND WILDLIFE ECONOMICS: DOLLAR VALUATION AND BEYOND. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 207-215. 1978. SFA 24(4)
[Dep. Agric. Econ., Univ. Wis., Madison]

79-003102 Cauvin, D. M. REGULATING ACCESS IN CANADA'S INLAND FISHERIES. J. Fish. Res. Board Can. 36 (7): 827-836. July 1979. In English with French summ. SFA 24(4)
[Dep. Fish. Oceans, Freshwater Inst., Winnipeg, MB R3T 2N6, Canada]

79-003103 Dickie, L. M. PERSPECTIVES ON FISHERIES BIOLOGY AND IMPLICATIONS FOR MANAGEMENT. J. Fish. Res. Board Can. 36 (7): 838-844. July 1979. In English with French summ. SFA 24(4)
[Dep. Fish. Oceans, Mar. Ecol. Lab., Dartmouth, NS B2Y 4A2, Canada]

79-003104 Gibbs, E. J. QUINNAT SALMON MANAGEMENT IN SOUTH WESTLAND. Wildl. Rev. N.Z. Wildl. Serv. No. 9. p. 5-8. 1978. SFA 24(4)

79-003105 Hendee, J. C.; Bryan, H. SOCIAL BENEFITS OF FISH AND WILDLIFE CONSERVATION. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 234-254. 1978. SFA 24(4)

79-003106 Manfredo, M. J.; Brown, P. J.; Haas, G. E. FISHERMAN VALUES IN WILDERNESS. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 276-297. 1978. SFA 24(4)
[Coll. For. Nat. Resour., Colo. State Univ., Fort Collins 80523]

79-003107 Meyer, P. A. MEASUREMENT OF COMPENSATION FOR LOSSES TO FISH AND WILDLIFE. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 216-228. 1978. SFA 24(4)

79-003108 Mitchell, C. L. BIOECONOMICS OF COMMERCIAL FISHERIES MANAGEMENT. J. Fish. Res. Board Can. 36 (6): 699-704. June 1979. In English with French summ. SFA 24(4)
[Dep. Fish. Oceans, Fish. Serv. Dir., Ottawa, ON K1A 0E6, Canada]

79-003109 Nielsen, L. A.; Summers, P. B., Jr. JOURNAL USE IN FISHERIES AS DETERMINED BY CITATION ANALYSIS. Fisheries (Bull. Am. Fish. Soc.) 4 (2): 10-11, 21. Mar.-Apr. 1979. SFA 24(4)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA]

79-003110 Randall, A. CONTINGENT VALUATION METHODS FOR FISH AND WILDLIFE RESOURCES. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies. 58: 229-233. 1978. SFA 24(4)
[Dep. Agric. Econ., Univ. Ky., Lexington]

79-003111 Schwartz, H. S. MISSOURI "DESIGN FOR CONSERVATION". Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 583-586. 1977[1979]. SFA 24(4)
[Mo. Dep. Conserv., St. Louis]

79-003112 Wlodek, J. M. STUDIES ON THE INFLUENCE OF MAN (ANGLING) ON FRESHWATER FISH POPULATIONS IN SOUTHERN POLAND. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2142-2145. 1978. SFA 24(4)
[Zaklod Biol. Wod Polskiej Akad. Nauk, Slawkowska 17, Krakow, Poland]

ADMINISTRATION AND PLANNING

79-003113 Chapman, D. G. FISHERIES EDUCATION AS VIEWED FROM INSIDE. Fisheries (Bull. Am. Fish. Soc.) 4 (2): 18-21. Mar.-Apr. 1979. SFA 24(4)
[Coll. Fish., Univ. Wash., Seattle] This paper reviews the problems of and current trends in bachelor of science programs in fisheries in those universities that have such training. It is noted that many students go into fisheries work from other programs; e.g., marine science, marine biology. Programs at representative institutions are summarized. Arguments are given in favor of specific fisheries programs at the B.S. level, but it is also argued that there may have to be alternative pathways with possibly a fifth year in some cases. Accreditation is not recommended, though there needs to be better exchange of information between students and universities and potential employers so that all are fully aware of the needs and expectations of the others. The value of cooperative education programs is noted, and it is suggested that such programs particularly provide a means for potential employers of fisheries graduates to help mold the undergraduate program of their future employees. In this way the contribution of the employee to the organization can be maximized, though the program must still be designed to assure that kind of basic education that will not simply be immediate vocational training but that will prepare the student to keep up with changes he will meet. Finally some remarks are made on the use of computers and programmed learning techniques, which at the moment are developing more slowly than expected. This trend seems likely to continue.

79-003114 Donaldson, J. R. FISHERIES EDUCATION FROM THE STATE PERSPECTIVE. Fisheries (Bull. Am. Fish. Soc.) 4 (2): 24-26. Mar.-Apr. 1979. SFA 24(4)
[11620 NW Bel Aire, Beaverton, OR 97005] The requirements necessary for state employees to deal effectively with today's fisheries resource problems are beyond the training presently being provided in our universities. University curricula must be restructured to produce persons fully capable of thinking, reasoning, and communicating. The emphasis on selecting students for admission into the universities should be based on quality instead of quantity. Our future fisheries biologists need to be exposed to a course of studies that reduces the traditional technique development and factual memorization in favor of development of skills in topical problem-solving. Professors should spend more time in direct association with what is actually happening within the resources.

79-003115 Everest, F. H. HOW TO DEMONSTRATE THE IMPORTANCE OF FISHERY RESOURCES TO INTERDISCIPLINARY PLANNING TEAMS. Fisheries (Bull. Am. Fish. Soc.) 3 (6): 15-20. Nov.-Dec. 1978. SFA 24(4)
[U.S. For. Serv., Pac. Northwest For. Range Exp. Stn., Corvallis, OR] U.S. Forest Service interdisciplinary teams are currently involved in extensive land use planning that results in allocation of unroaded Federal land for specific purposes. Fishery professionals can demonstrate the importance of the aquatic resource by providing resource managers with estimates of net economic values of fishery resources. The impact that fishery evaluation can exert on allocation of land is illustrated with a specific example from Oregon. In the example, the value of fish produced by the Mt. Butler/Dry Creek Planning Unit exceeded the value of other resources. Consequently, 45 percent of the unit was allocated for production of fish and recreation.

79-003116 Hester, F. E. FISHERIES EDUCATION FROM THE FEDERAL PERSPECTIVE. Fisheries (Bull. Am. Fish. Soc.) 4 (2): 22-24. Mar.-Apr. 1979. SFA 24(4)
[U.S. FWS, Interior Bldg., Washington, DC] Federal fisheries responsibilities are becoming more complex, but without commensurate increases in numbers of personnel. There is am important need to provide a broader education with increased exposure to decision-making and to the political system.

79-003117 Lackey, R. T. FISHERIES EDUCATION IN THE 1980'S: THE ISSUES. Fisheries (Bull. Am. Fish. Soc.) 4 (2): 16-17. Mar.-Apr. 1979. SFA 24(4)
[Dep. Fish. Wildl. Sci., VPI&SU, Blacksburg, VA] As a profession grows and matures its members typically take a greater collective interest in the education of future members of that profession. Many members of the American Fisheries Society are now actively involved in a discussion of the status and future direction of fisheries education. There are many issues in fisheries education: curriculum, "training vs. education," unemployment, role of theses, grade inflation, certification, accreditation, civil service requirements, teaching effectiveness, continuing education, and the role of "soft" funds in academia.

79-003118 Olmsted, L. L. FISHERIES EDUCATION FROM THE PRIVATE SECTOR PERSPECTIVE. Fisheries (Bull. Am. Fish. Soc.) 4 (2): 26-28. Mar.-Apr. 1979. SFA 24(4)
[Duke Environ. Lab., Rt. 3, Box 90, Huntersville, NC 28078] Preparation of a fisheries scientist for a job in private industry is not greatly different from preparation of a fisheries scientist for a job in government or academia. Basically, a fisheries scientist's education must develop his abilities to reason and to communicate. Presently, North American universities are doing a barely acceptable job of educating fisheries scientists. Significant improvement can be achieved through broadening coursework, requiring short-term individual research with detailed analysis, and encouraging practical exercies in interdisciplinary work. The responsibility of private industry rests mainly in providing intern jobs or co-op programs, providing on-the job training, and making resources available to universities. However, the attitude and efforts of the individual professors represent the most critical factor in the preparation of fisheries scientists for employment in private industry.

79-003119 Tomlinson, J. W. C.; Brown, P. S. DECISION ANALYSIS IN FISH HATCHERY MANAGEMENT. Trans. Am. Fish. Soc. 108 (2): 121-129. Mar. 1979. SFA 24(4)
[Div. Int. Business Stud., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

REPORTS OF FISHERY STATIONS, STATES, ETC.

79-003120 FAO of the UN REPORT OF THE TWELFTH SESSION OF THE COMMITTEE ON FISHERIES. FAO Fish. Rep. No. 208. x + 32p. 1978. SFA 24(4)
[Rome, Italy]

HABITAT ALTERATION

79-003121 Baril, S. F.; Luedtke, R. J.; Roemhild, G. R. ENVIRONMENTAL EFFECTS OF WESTERN COAL COMBUSTION. PART II-THE AQUATIC MACROINVERTEBRATES OF ROSEBUD CREEK, MONTANA. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-099. ix + 75p. Nov. 1978. SFA 24(4)
[Dep. Biol., Mont. State Univ., Bozeman 59717] The aquatic macroinvertebrates of Rosebud Creek, Montana, were sampled between February 1976 and March 1977 to provide data on their abundance, distribution, and diversity. The sampling program was initiated during the first year of operation of the coal-fired power plants located at Colstrip, Montana. The purpose of the study was to determine if any immediate impacts of the power plant operation on the macroinvertebrate communities of Rosebud Creek could be detected and to provide data for comparisons with future studies. Rosebud Creek supported a diverse bottom fauna with high population numbers composed of species adapted to the turbid, silty conditions which are common in the prairie streams of eastern Montana. Intact riparian vegetation appeared to be important in maintaining stream bank stability and provided an essential food source. It was concluded that faunal variation among sampling stations during the study period was attributable to physical factors including turbidity, water temperature, current velocity, and substrate, and not to potential impacts from coal mining and combustion.

79-003122 Ben-Tuvia, A.; Ben-Yami, M. MAN'S INFLUENCE ON THE FISH POPULATIONS IN THE BARDAWIL LAGOON ON THE NORTHERN COAST OF SINAI. Proc. Sci. Conf. Isr. Ecol. Soc. 4: e16-e17. 1973. SFA 24(4)
[Isr. Oceanogr. Limnol. Res., Haifa, Israel]

79-003123 Butts, T. A.; Evans, R. L. EFFECTS OF CHANNEL DAMS ON DISSOLVED OXYGEN CONCENTRATIONS IN NORTHEASTERN ILLINOIS STREAMS. Ill. State Water Surv. Circ. 132. 153p. 1978. SFA 24(4)
[Ill. State Water Surv., Urbana]

79-003124 Cline, L. D.; Ward, J. V. THE IMPACT OF HIGHWAY CONSTRUCTION ON A SMALL, HIGH MOUNTAIN STREAM. Bull. Ecol. Soc. Am. 60 (2): 122. June 1979. Abstract only. SFA 24(4)
[Colo. State Univ., Fort Collins 80523] A small, high mountain stream in north central Colorado was sampled over a three-year period to assess the impact of highway construction activities on physico-chemical and biological parameters. Data from four sampling sites indicated no apparent effect on ten parameters, including temperature and dissolved oxygen. Construction apparently did affect substrate composition, suspended solids, and macroinvertebrate composition. Results suggest that the biota of high mountain streams, which have a high gradient and which lack pools and quiet backwaters, are able to recover in a relatively short time following construction activities, providing: 1) populations for recolonization are avilable above the impact area, 2) the impact is of short duration, 3) the impact affects a relatively short stream section, and 4) the impact is not an annual event. Long-term sublethal effects on ecological phenomena may not, however, be apparent using current methods of investigation.

79-003125 Everest, F. H. ANADROMOUS FISH HABITAT AND FOREST MANAGEMENT--ECONOMIC CONSIDERATIONS. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 153-171. 1978. SFA 24(4)
[USFS, Pac. Northwest For. Range Exp. Stn., Corvallis, OR]

79-003126 Johnson, R. R.; McCormock, J. F. , (Tech. Coor.) STRATEGIES FOR PROTECTION AND MANAGEMENT OF FLOODPLAIN WETLANDS AND OTHER RIPARIAN ECOSYSTEMS. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. WO-12. vi + 410p. Feb. 1979. SFA 24(4)

79-003127 Kelly, W. EVALUATION OF THE ENVIRONMENTAL EFFECTS OF WESTERN SURFACE COAL MINING. VOLUME II: MINE INVENTORY. U.S. Environ. Prot. Agency Res. Rep. Ser. EPA-600/7-78-034. vii + 197p. Feb. 1979. SFA 24(4)
[Mathematica, Inc., Mathtech Div., Princeton, NJ 08540]

79-003128 Leitner, P. IMPACTS OF GEOTHERMAL DEVELOPMENT ON FISH AND WILDLIFE. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 308-318. 1978. SFA 24(4)
[Biol. Dep., St. Mary's Coll. Calif., Moraga]

79-003129 Lindenberg, J. G. ARE ARTIFICIAL REEFS THE ANSWER? Mass. Wildl. 30 (2): 2-6. Mar.-Apr. 1979. SFA 24(4)
[Mass. Div. Fish. Wildl., Westborough]

79-003130 McGowan, T. A. WESTERN COAL DEVELOPMENT: STRATEGIES TO MINIMIZE IMPACT ON WILDLIFE. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies. 58: 298-307. 1978. SFA 24(4)
[U.S.FWS, WELUT, 2625 Redwing, Fort Collins, CO 80526]

79-003131 Okamoto, M.; Kuroki, T.; Murai, T. [PRELIMINARY STUDIES ON THE ECOLOGY OF FISHES NEAR ARTIFICIAL REEFS--OUTLINE OF THE ARTIFICIAL REEFS OFF SARUSHIMA ISLAND.] Bull. Jpn. Soc. Sci. Fish. 45 (6): 709-713. June 1979. In Japanese with English summ. SFA 24(4)
[Jpn. Mar. Sci. Technol. Cent., Natsushima, Yokosuka 237, Japan] To determine the ecology and the gathering factor of fishes near artificial reefs by using diving technique effectively, a series of direct observation studies was carried out north of Sarushima Island near Yokosuka. As the results, some fundamental phenomena were observed, such as setting configuration of artificial reefs, current, settled animals, benthoses and gathering fishes. Artificial reefs were laid down at a depth of between 15 and 25 m in a range of 80 x 50 m, separated into three groups. One of them was a sunken ship reef (wooden ship about 100 ton) and the others were concrete block reefs located in the direction of the bow and the starboard side of the ship. Although these artificial reefs were laid down for about 10 years, they seemed to maintain their original form. Fifteen kinds of fish were found near the artificial reefs, and they were mostly rock fish or settled-type fish. /Sebastes inermis/, "Mebaru" in Japanese, was superior here and more often observed near the sunken ship reef than near the concrete block reefs.

79-003132 Oliver, J. L.; Hudson, P. L.; Clugston, J. P. EFFECTS OF A PUMPED STORAGE HYDROELECTRIC PLANT ON RESERVOIR TROUT HABITAT. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 449-457. 1977[1979]. SFA 24(4)
[U.S. FWS, Southeast Reservoir Investigations, Clemson, SC 29631] Jocassee Reservoir (3,063 ha) is the upper pool for a 610-MW pumped storage hydroelectric plant in northwestern South Carolina. Trout (200-225 mm long) have been stocked annually since 1972. The volume of trout habitat during summer has decreased annually from 1973 to 1976, and is associated with increases in the temperature and volume of water pumped from the lower reservoir. The top of the thermocline during September was lowered from about 9 m in 1973 to nearly 19 m in 1976, and trout habitat was reduced by about 65 percent. On the basis of a regression presented, we predict that trout habitat will be reduced to nil when plant operation reaches 63 percent of capacity (perhaps by 1981).

79-003133 Reeves, W. C.; Hooper, G. R.; Smith, B. W. PRELIMINARY OBSERVATIONS OF FISH ATTRACTION TO ARTIFICIAL MIDWATER STRUCTURES IN FRESHWATER. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 471-476. 1977[1979]. SFA 24(4)
[Ala. Game Fish Div., Fish. Sect., 64 N. Union St., Montgomery 36130] Midwater artificial structures were placed in a freshwater reservoir to determine if fish would associate with these structures. SCUBA observations were used to evaluate the effectiveness of the structures. Alabama spotted bass (/Micropterus punctulatus henshalli/) and bluegill sunfish (/Lepomis macrochirus/) were attracted to structures suspended over water depths up to 33 m and as far as 250 m from the shoreline. Behavioral observations of fish on structures and the development and subsequent association of spotted bass fry spawned on a strucutre are discussed.

79-003134 Szabo, M. F. ENVIRONMENTAL ASSESSMENT OF COAL TRANSPORTATION. U.S. Environ. Prot. Agency Res. Rep. Ser. EPA-600/7-78-081. x + 142p. May 1978. SFA 24(4)
[PEDCo Environmental, Inc., Cincinnati, OH 45246]

79-003135 Tippett, R. EFFECT OF A PUMP-STORAGE HYDRO-ELECTRIC SCHEME ON THE STRATIFICATION AND ECOLOGY OF A SCOTTISH LOCH. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2697-2700. 1978. SFA 24(4)
[Dep. Zool., Univ. Glasgow, Glasgow, G12 8QQ, Scotland]

79-003136 Toetz, D. W. BIOLOGICAL AND WATER QUALITY EFFECTS OF ARTIFICIAL MIXING OF ARBUCKLE LAKE, OKLAHOMA, DURING 1977. Hydrobiologia 63 (3): 255-262. 27 Apr. 1979. SFA 24(4)
[Sch. Biol. Sci., Okla. State Univ., Stillwater 74074] This paper describes the effects of total lake mixing with 16 axial flow (Garton) pumps on the water quality, algal biomass and community metabolism of Arbuckle Lake, Oklahoma. Pumping began on July 1, 1977, and subsequently lowered the thermocline throughout the lake. The concentration of dissolved oxygen rose in formerly anoxic strata. Water quality in the former hypolimnion improved. Concentration of ammonia and BOD(5) decreased, and concentrations of manganese remained unchanged in 1977 compared to the control year (1976). But, concentrations of sulfide in the hypolimnion were higher in 1977 than in 1976. Algal biomass as chlorophyll /a/ was about the same in 1977 as in 1978. The depth of the Secchi disc was also the same. An algal bloom did not occur. Pumping decreased the ratio gross production: community respiration as measured by a free water method, suggesting that lakes which are artificially mixed will have lower net primary productivities than lakes which are not artificially mixed.

HARVEST, CREEL CENSUS

79-003137 Aggus, L. R.; Morais, D. I.; Baker, R. F. EVALUATION OF THE TROUT FISHERY IN THE TAILWATER OF BULL SHOALS RESERVOIR, ARKANSAS, 1971-73. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 565-573. 1977[1979]. SFA 24(4)
[U.S. FWS, Natl. Reservoir Res. Prog., Fayetteville, AR 72701] The fishery for rainbow trout (/Salmo gairdneri/) in the Bull Shoals tailwater has developed as a seasonal boat fishery which in peak years provides more than 250,000 angler days of fishing, and a catch of more than 750,000 trout. Use was concentrated along the upstream one-third (48 km) of the tailwater in 1971-73, where about 60 percent of the total fisherman effort, 50 percent of the catch, and 75 percent of the total guided fishing occurred. Since many anglers traveled long distances, rented boats and motors, and employed guides to fish the tailwater, the economic value of the fishery was high. As in most fisheries in cold tailwaters in the South, erratic patterns of water release strongly influenced fisherman use and harvest. During 1971 and 1972, years of below average water release, fishermen caught about 95 percent of the trout stocked. Sustained high water releases at Bull Shoals Dam in 1973 were associated with marked reductions in angling effort and in numbers of fish caught/hr, but with only a slight reduction in the weight of fish harvested/hr. Regression equations are presented to describe relations between angling activity and patterns of water release over a wide range of flows.

79-003138 Barclay, J. C. BENEFITS AND COSTS OF SALMON ENHANCEMENT: THE BRITISH COLUMBIA CASE. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 383-411. 1978. SFA 24(4)
[Dep. Fish. Environ., Vancouver, BC, Canada]

79-003139 Carlander, K. D.; HadiKastowo AMOUNTS AND SPECIES COMPOSITION OF FISH HARVESTED FROM RAWA PENING, 1978. J. Satya Wacana Res. 1 (5): 474-492. 1978. SFA 24(4)
[Dep. Anim. Ecol., Iowa State Univ., Ames 50010] Average daily amount of fish from Rawa Pening per market (29 days sampled) May to Sept. 1978 was 7.31 kg, which is only 9.9 percent of that reported in 1975. /Glyptosternum platipogon/, /Cyprinus carpio/, and /Tilapia mossambica/, which constituted 2.5 kg/day in 1975 were not recored in 1978. /Puntius javanicus/ constituted 59 percent of catch in 1940, 10 percent in 1975, and only 0.3 percent in 1978. Average sizes taken in 1978 were smaller than in 1975 the most important species averaging: /Osteochilus hasselti/ 38 g, /Ophiocephalus striatus/ 119 g, /Trichogaster trichopterus/ 6 g, minnows (/Puntius/ spp., /Rasbora/ sp.) 8 g, /Clarias batrachus/ 96 g, /Anabas testudineus/ 29 g, and /T. pectoralis/ 20 g. Suggestions were made for evaluating methods of collecting samples of the catch. Reported harvest has dropped from 600-800 kg/ha in 1963-71, to 180 in 1975, and 18 in 1978. Abundance of water hyacinth which was earlier reported to have reduced fish harvest is probably not the reason for the recent decline.

79-003140 FAO of the UN 1977 YEARBOOK OF FISHERY STATISTICS. FISHERY COMMODITIES. VOL. 45. FAO Fish. Ser. 9. xvi + 283p. 1978. SFA 24(4)
[Rome, Italy]

79-003141 FAO of the UN 1977 YEARBOOK OF FISHERY STATISTICS. CATCHES AND LANDINGS. VOL. 44. FAO Fish. Ser. 8. xii + 343p. 1978. SFA 24(4)
[Rome, Italy]

79-003142 Harmon, P. L. SURVEY OF ANGLERS ON THE SCHUYLKILL RIVER NEAR POTTSTOWN, PENNSYLVANIA IN 1976. Proc. Pa. Acad. Sci. 52 (2): 1978. SFA 24(4)
[Radiation Management Corp., Pottstown Ecol. Lab., Fricks Lock Rd., R.D. 1, Pottstown, PA 19464] Angler use of the Schuylkill River near Pottstown, Pennsylvania was investigated from 2 June through 5 September 1976. Two survey areas in the vicinity of Limerick Generating Station were sampled by a roving interview agent. Anglers fished primarily at easily accessible stream bank locations. Recreation was the primary objective of fishing, and most anglers were nonselective as to what fishes they sought. Sunfishes and catfishes were the most frequently taken fishes based primarily on data provided by the anglers.

79-003143 Huppert, D.; McMillan, J. CALIFORNIA'S WETFISH AND MARKET FISH FISHERIES-- ECONOMIC VALUES. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 412-426. 1978. SFA 24(4)
[NMFS, Southwest Fish. Cent., La Jolla, CA 92038]

79-003144 Ingram, B. S. ECONOMIC ACTIVITY RELATED TO MARINE RECREATIONAL FISHING. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 524-542. 1978. SFA 24(4)
[Centaur Management Consultants, Inc., Washington, DC]

79-003145 Manooch, C. S. III; Laws, S. T. SURVEY OF THE CHARTER BOAT TROLL FISHERY IN NORTH CAROLINA, 1977. Mar. Fish. Rev. 41 (4): 15-27. Apr. 1979. SFA 24(4)
[NMFS, Southeast Fish. Cent., Beaufort, NC 28516] North Carolina's 127 charter boats made 7,935 trips trolling for pelagic fishes in 1977. The number of boats fishing for pelagic species varied from 65 to 107 depending on the month. Excluding billfishes, 238,413 fish weighing 1.6 million pounds (726 metric tons) were caught, an average of 30 fish and 198 pounds per trip. Major species landed by weight were: king mackerel, /Scomberomorus cavalla/, 737,680 pounds (334.7t); bluefish, /Pomatomus saltatrix/, 244,618 pounds (110.0t); dolphin, /Coryphaena hippurus/, 174,735 pounds (79.3t); amberjack, /Seriola/ spp., 108,998 pounds (49.4t); and wahoo, /Acanthocybium solanderi/, 76,324 pounds (34.6t). Catch per unit effort varied with season and geographic area and reflected fish migrations. The highest catch rate occurred in October, 44.9 fish per trip, and the lowest in July, 16.3 fish per trip. Boats fishing out of Oregon Inlet and Hatteras Village usually caught a higher percentage of oceanic pelagic species (dolphin, tunas, etc.) and, as a result, had higher mean weights per fish landed.

79-003146 Meacham, C. P.; Randall, R. , (eds.) BRISTOL BAY SOCKEYE SALMON (/ONCORHYNCHUS NERKA/) 1976. A COMPILATION OF CATCH AND ESCAPEMENT DATA. Alaska Dep. Fish Game Tech. Data Rep. No. 43. 77p. 1979. SFA 24(4)
[Alaska Dep. Fish Game, Anchorage]

79-003147 Randall, R.; Yuen, H. , (eds.) BRISTOL BAY SOCKEYE SALMON (/ONCORHYNCHUS NERKA/) 1975. A COMPILATION OF CATCH AND ESCAPEMENT DATA. Alaska Dep. Fish Game Tech. Data Rep. No. 40. 71p. 1978. SFA 24(4)
[Alaska Dep. Fish Game, Anchorage]

79-003148 Stokes, R. L. ECONOMIC EVALUATION OF WASHINGTON MARINE RESOURCES. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 427-443. 1978. SFA 24(4)
[Inst. Mar. Stud., Univ. Wash., Seattle]

79-003149 Trudeau, H. R. CANADIAN ARCTIC FISHERIES--COSTS & BENEFITS. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 345-369. 1978. SFA 24(4)

79-003150 Weithman, A. S.; Katti, S. K. TESTING OF FISHING QUALITY INDICES. Trans. Am. Fish. Soc. 108 (3): 320-325. May 1979. SFA 24(4)
[Mo. Dep. Conserv., Columbia 65201]

REGULATIONS

79-003151 Adasiak, A. ALASKA'S EXPERIENCE WITH LIMITED ENTRY. J. Fish. Res. Board Can. 36 (7): 770-782. July 1979. In English with French summ. SFA 24(4)
[1835 Crescent Dr., Anchorage, AK 99504]

79-003152 Crutchfield, J. A. ECONOMIC AND SOCIAL IMPLICATIONS OF THE MAIN POLICY ALTERNATIVES FOR CONTROLLING FISHING EFFORT. J. Fish. Res. Board Can. 36 (7): 742-752. July 1979. In English with French summ. SFA 24(4)
[Dep. Econ., Univ. Wash., Seattle 98195]

79-003153 Fraser, G. A. LIMITED ENTRY: EXPERIENCE OF THE BRITISH COLUMBIA SALMON FISHERY. J. Fish. Res. Board Can. 36 (7): 754-763. July 1979. In English with French summ. SFA 24(4)
[Dep. Fish. Oceans, Salmon Enhancement Prog., Vancouver, BC V6E 2P1, Canada]

79-003154 Keith, B. PROS AND CONS OF MINIMUM SIZE LIMITS ON BLACK BASS. Arkansas Game Fish 10 (3): 18-21. 1978. SFA 24(4)
[Ark. Game Fish Comm., No. 2 Natural Resources Dr., Little Rock 72205]

79-003155 Moloney, D. G.; Pearse, P. H. QUANTITATIVE RIGHTS AS AN INSTRUMENT FOR REGULATING COMMERCIAL FISHERIES. J. Fish. Res. Board Can. 36 (7): 859-866. July 1979. In English with French summ. SFA 24(4)
[Dep. Econ., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

79-003156 Needler, A. W. H. EVOLUTION OF CANADIAN FISHERIES MANAGEMENT TOWARDS ECONOMIC RATIONALIZATION. J. Fish. Res. Board Can. 36 (7): 716-724. July 1979. In English with French summ. SFA 24(4)
[Huntsman Mar. Lab., St. Andrews, NB E0G 2X0, Canada]

79-003157 Pearse, P. H. INTRODUCTION TO THE SYMPOSIUM ON MANAGING FISHING EFFORT. J. Fish. Res. Board Can. 36 (4): 711-714. July 1979. SFA 24(4)
[Dep. Econ., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

79-003158 Pelzman, R. J. EFFECTS OF A 305-MM (12.0-INCH) MINIMUM SIZE LIMIT ON LARGEMOUTH BASS, /MICROPTERUS SALMOIDES/, AT MERLE COLLINS RESERVOIR. Calif. Fish Game 65 (3): 141-150. July 1979. SFA 24(4)
[Calif. Dep. Fish Game, Inland Fish. Br., 987 Jedsmith Dr., Sacramento 95819] A 305-mm minimum size limit on largemouth bass, /Micropterus salmoides/, imposed in 1972 at Merle Collins Reservoir, Yuba County, was evaluated by an extensive creel census. Angler harvest of largemouth bass was reduced over 50 percent, with good public acceptance and without reductions in game fish yields. Combined annual weights of largemouth and smallmouth bass, /M. dolomieui/, decreased only about 3 percent. The size limit apparently also protected smallmouth and spotted bass, /M. punctulatus/, less than 305 mm total length.

79-003159 Rogers, G. W. ALASKA'S LIMITED ENTRY PROGRAM: ANOTHER VIEW. J. Fish. Res. Board Can. 36 (7): 783-788. July 1979. In English with French summ. SFA 24(4)
[Univ. Alaska, Inst. Social Econ. Res., Juneau 99801]

79-003160 Scott, A. DEVELOPMENT OF ECONOMIC THEORY ON FISHERIES REGULATION. J. Fish. Res. Board Can. 36 (7): 725-741. July 1979. In English with French summ. SFA 24(4)
[Dep. Econ., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

79-003161 Wilen, J. E. FISHERMAN BEHAVIOR AND THE DESIGN OF EFFICIENT FISHERIES REGULATION PROGRAMS. J. Fish. Res. Board Can. 36 (7): 855-858. July 1979. In English with French summ. SFA 24(4)
[Inst. Environ. Stud., Univ. Wash., Seattle 98195]

FISH CONTROL AND REMOVAL

79-003162 Hanafi, A.; Duursma, E. K. USE OF PESTICIDES IN BRACKISHWATER PONDS. 2. EFFECT OF PHOSVEL ON FISH AND SHRIMP. Bull. Shrimp Cult. Res. Cent. (Jepara) 2 (1-2): 143-157. Jan.-July 1976. SFA 24(4)
[Shrimp Cult. Res. Cent., Jepara, Indonesia] Laboratory and field experiments were conducted to know the effect to phosvel (trade name for leptophos) on milkfish (/Chanos chanos/), tilapia (/Tilapia mossambica/) and chironomid (/Tendipes longilobus/) larvae. At 0.5 ppm a.i. level phosvel 30 percent kills all tilapia without having harmful effect on milkfish. Shrimps (/Penaeus merguiensis/) seem to be more sensitive to this pesticide, having LD(100)-12 hours with 0.05 ppm, while for chironomid larvae LD(100)-96 hours with 0.5 ppm. Observations on the persistence of leptophos show a rapid dissipation of its residues in water for which they are undetectable after 12 days. It might be absorbed into the mud and becomes undetectable after 60 days. The residue in killed tilapia and live milkfish showed almost no difference in uptake. The residue in living milkfish was undetectable after 60 days.

79-003163 Hanson, L. H.; Manion, P. J. CHEMOSTERILIZATION OF THE SEA LAMPREY (/PETROMYZON MARINUS/). Great Lakes Fish. Comm. Tech. Rep. No. 29. 15p. July 1978. SFA 24(4)
[U.S. FWS, Hammond Bay Biol. Stn., Millersburg, MI 49759]

79-003164 Holey, M.; Hollender, B.; Imhof, M.; Jesien, R.; Konopacky, R.; Toneys, M.; Coble, D. "NEVER GIVE A SUCKER AN EVEN BREAK". Fisheries (Bull. Am. Fish. Soc.) 3 (6): 2-6. nov.-Dec. 1978. SFA 24(4)
Suckers are thought to be harmful to other species of fish because of predation on eggs and fry and from competition, mainly for food. This belief has led to many sucker removal projects to enhance sport fisheries. In a review of the literature, we found that (1) although suckers eat eggs and fry of some fishes, there was no evidence that such predation is harmful to prey populations; (2) studies suggesting competition for food failed to demonstrate that food was limiting (which is necessary for competition to occur); (3) evidence is equivocal that sport fish populations fare better in the absence of

79-003164 CONTINUED
suckers or after sucker removal programs. Reasons for the poor evidence that suckers are detrimental are the complexity of species interactions in aquatic communities, particularly interactive segregation, as well as the lack of removal projects in which sucker removal alone was the sole variable. Guidelines are suggested for studies designed to elucidate the role of suckers in fish communities.

79-003165 Kuroki, T.; Katayama, Y. [UNDERWATER SOUND BARRIER FOR CONTROLLING FISH SCHOOL.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 6: 35-46. 1977[1978]. In Japanese with English summ. SFA 24(4)
[Tokyo Univ. Fish., Konan, Minato-ku, Tokyo, Japan]

79-003166 Purvis, H. A. VARIATIONS IN GROWTH, AGE AT TRANSFORMATION, AND SEX RATIO OF SEA LAMPREYS REESTABLISHED IN CHEMICALLY TREATED TRIBUTARIES OF THE UPPER GREAT LAKES. Great Lakes Fish Comm. Tech. Rep. No. 35. 36p. May 1979. SFA 24(4)
[U.S. FWS, P.O. Box 758, Marquette, MI 49855] Growth and age at metamorphosis were determined for populations of larval sea lampreys that became reestablished after chemical treatments of tributaries of Lakes Superior and Michigan with the selected lampricide, 3-trifluoromethyl-4-nitrophenol. Age at metamorphosis varied from 3 to 7 years. Growth of ammocetes varied considerably from stream to stream and within streams. Mean lengths of ammocetes of age group III in late summer or early fall in different streams ranged from 65 to 144 mm. Ammocetes of the first year class established after a chemical treatment grew faster than those of succeeding year classes. Transformation at an early age usually occurred only among fast-growing larvae in large streams. A reversal of the sex ratio, from predominately male to predominately female, followed the reduction of the adult sea lamprey population. Sex ratios of larval and recently metamorphosed sea lampreys reestablished after chemical treatments rapidly shifted from an excess of males to an excess of females. The shift in sex ratio was related to decreased densities of sea lampreys resulting from treatments.

MARKING AND TAGGING

79-003167 Ichihara, T. [BEHAVIORAL STUDY OF FISHES BY ULTRASONIC TELEMETRY TECHNIQUE.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 75-86. 1974[1977]. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka-ken, Japan]

79-003168 Kohlhorst, D. W. EFFECT OF FIRST PECTORAL FIN RAY REMOVAL ON SURVIVAL AND ESTIMATED HARVEST RATE OF WHITE STURGEON IN THE SACRAMENTO-SAN JOAQUIN ESTUARY. Calif. Fish Game 65 (3): 173-177. July 1979. SFA 24(4)
[Calif. Dep. Fish Game, 4001 N. Wilson Way, Stockton 95205]

79-003170 Nakamura, A. [ULTRASONIC BIOTELEMETRY SYSTEM.] Fac. Mar. Sci. Tokai Univ. Collect. Repr. 9: 55-60. 1979. In Japanese with English summ. SFA 24(4)

[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan] Ultrasonic biotelemetry system consists of two parts; a very small (80 x 18 phi) ultrasonic transmitter to be fixed to the body of fish and receiver. In this system, environmental, behavioral, physiological factors are sent simultaneously with the movement of fish. Informations from living fish are telemetered to the receiver as a ultrasonic pulse interval, and then printed on the recording paper. Transmitting and receiving method devised by us, and characteristics of some sensors are explained in this paper.

79-003171 Sackett, S. R.; Hein, S. H. RESULTS OF A FLOY TAG RETENTION STUDY ON SPOTTED SEATROUT (/CYNOSCION NEBULOSUS/) IN 1/4-ACRE PONDS AT THE MARINE LABORATORY. La. Wildl. Fish. Comm. Tech. Bull. No. 28. p. 35-38. May 1979. SFA 24(4)

[La. Dep. Wildl. Fish., Mar. Res. Lab., Grand Terre Island] A pond study was set up to determine retention with the Floy Tag attached dorsally on the spotted seatrout (/Cynoscion nebulosus/). Fish were also checked for tag retention, general body conditions, infection in the tag area, and tag condition. Roughly 60 percent of the fish originally tagged retained their tags at the end of 90 days, although 27 percent of the remaining tags were broken or split.

79-003172 Soma, M. [ELECTRONIC DEVICES ADOPTED IN BIOTELEMETRY SYSTEM.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 87-100. 1974[1977]. In Japanese with English summ. SFA 24(4)

[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Shizuoka-ken, Japan]

79-003173 Suzuki, K. [FIXING METHOD OF AN ULTRASONIC TAG TO MARINE FISHES.] Fac. Mar. Sci. Tokai Univ. Collect. Repr. 9: 73-79. 1979. In Japanese with English summ. SFA 24(4)

[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan] Biotelemetering system of ultrasonic type for the tracking of fish is yielding good results since it was started in 1975. However, some important problems such as reliability of tagging techniques, tagging continuance, and reverse effects on movement or behavior of tagged fish, have been left unsolved. The tagging experiments of ultrasonic transmitters for yellowtails and other marine fishes were held in an oceanarium (10x10x6Hm) of Marine Science Museum, Tokai University in 1970-1972. Through a series of experiments the author has tried to find the most effective fixing method among towing and stomach-inserting type of the tag. In this paper, the processes and successful results in the experiments are described, and some points which are left as future problems are discussed.

STOCKING AND INTRODUCTIONS

79-003174 Aksiray, F. THE EXPERIMENTAL STOCKING OF LAKE IZMIK (TURKEY) WITH COREGONIDAE (SALMONIDAE). Bamidgeh 31 (1): 9-13. Mar. 1979. SFA 24(4)
[I.U. Fen. Fak. Radiobiyol. Kursusu, Vezmeeiler, Istanbul, Turkey] In the summer of 1954, Lake Izmik (Turkey) was stocked with 5 million Coregonidae fry imported from Lakes Laach, Transee and Mondsee (Austria). The first fish of this stocking (44.5 cm length) was caught only in 1975. In 1976, 6 fish were netted and in 1977, 3 more. An attempt has been made to postulate the basis for ths fish's scarcity in the lake after such intensive stocking.

79-003175 Hashimoto, S. [A RESEARCH ON CHUM FINGERLINGS FOR STOCKING--I.] Sci. Rep. Hokkaido Salmon Hatchery No. 33. p. 25-30. Mar. 1979. In Japanese with English summ. SFA 24(4)
[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiraku, Sapporo, Hokkaido, Japan] This paper is designed to investiage relations among the survival rate, the physical structure and the components of fingerlings when they are transferred into the sea water. In other words, it is to find out the quality and necessary conditions for stocked salmon by investigating rearing fingerlings in the diet test, and physical structures and components of stocked salmon. 1) It was general tendency that the corpulency of the dead was smaller than that of the live fish and the corpulency of the bigger one was inferior to that of the smaller one. 2) There found a considerable number of thin fishes among stocked ones in Chitose River on May 5 and 6, 1977. As compared to fat fishes it was recognized that those thin fishes had reserved more moisture to some extent in their muscle and less protein. 3) Thin fishes caught in Chitose River were clearly marked off from those survived at the time of being transferred into the sea water. It may be considered that especially thin fishes were not environmentally adaptable in their dawn stream migration.

79-003176 Hunt, R. L. EXPLOITATION, GROWTH, AND SURVIVAL OF THREE STRAINS OF DOMESTIC BROOK TROUT. Wis. Dep. Nat. Resour. Res. Rep. 99. 15p. Mar. 1979. SFA 24(4)
[Wis. Dep. Nat. Resour., Waupaca] Three strains of domestic brook trout (/Salvelinus fontinalis/) were stocked in three study lakes at 15-16 months of age. All three strains proved to be so vulnerable to angling that too few survivors were present after six months to warrant continuation of the study. Although some statistically significant differences were found in exploitation, growth, and survival between strains, replacing the standard Osceola strain with the New Hampshire or Assinica strains to improve field performance of stocked brook trout is not justified.--From abstr.

79-003177 Ishida, T.; Sasaki, S.; Sato, Y. [STUDIES ON THE PLANTING OF HATCHERY-CULTURED MASU SALMON FRY INTO STREAMS. 7. EFFECT OF RELEASED TIME AND PRIORITY ON THE RESIDENCE OF FRY.] Sci. Rep. Hokkaido Salmon Hatchery No. 33. p. 1-6. Mar. 1979. In Japanese with English summ. SFA 24(4)
[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiraku, Sapporo, Hokkaido, Japan] Fin-clipped masu fry were released to examine the optimum releasing time and effect of priority on residence. No differences as to dispersal were observed between morning and evening released groups. Between one day and the one day after released groups, fry in the former group showed larger body size than the

79-003177 CONTINUED
latter by the summer. The fry resided near released points showed faster growth than the fry dispersed to lower regions. Residence rate of the released group was better at the mild flow time than at the rising flow time.

79-003178 Krueger, C. C.; Menzel, B. W. EFFECTS OF STOCKING ON GENETICS OF WILD BROOK TROUT POPULATIONS. Trans. Am. Fish. Soc. 108 (3): 277-287. May 1979. SFA 24(4)
[219 Hodson Hall, 1980 Folwell Ave., St. Paul, MN 55108]

79-003179 Lasswell, J. L.; Garza, G.; Bailey, W. H. STATUS OF MARINE FISH INTRODUCTIONS INTO THE FRESH WATERS OF TEXAS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 399-403. 1977[1979]. SFA 24(4)
[Tex. Parks Wildl. Dep., Ingram 78025] Techniques have been developed for spawning adult southern flounder (/Paralichthys lethostigma/), spotted seatrout (/Cynoscion nebulosus/), and red drum (/Sciaenops ocellata/) and rearing their larvae for freshwater acclimation and introduction into heated freshwater reservoirs in Texas. Egg production, percentage egg fertilization, percentage hatch, percentage return of larvae stocked into laboratory aquaria and hatchery ponds, and potential for fingerling survival in fresh water were compared for the 3 species. Red drum was found to be the most suitable for culture and introduction into fresh water. A diagram and estimated construction cost of a laboratory facility for holding and spawning marine fishes is presented.

79-003180 Moring, J. R. AN ECONOMIC EVALUATION OF A SMALL OREGON CATCHABLE TROUT FISHERY, WITH MEANS OF IMPROVING THE VALUE THROUGH STOCK SELECTION. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 543-547. 1978. SFA 24(4)
[1755 NW Arthur Cir., Corvallis, OR 97330] Mill Creek is a typical stream representative of Oregon's catchable trout stocking program. Since 1974, an average of 5,138 legal-sized (greater than 15 cm) rainbow trout have been stocked in the stream, from April to July. In that same time period, anglers have annually caught 53.1 to 76.8 percent of the trout stocked and expended 3,689 to 6,226 angler-days. Based on the currently utilized value of $10.60/day for resident trout (developed in the state of Oregon), this stocking program generates a trout fishery averaging $47,676. The cost of producing these fish averaged $3.85/kg ($1.75/lb), resulting in an average annual expenditure of $3,372 and gross benefit/cost ratio of 14.1:1. There are several means of improving this ratio further, primarily by selection of more efficient stocks. A series of field experiments on two streams have indicated the most commonly stocked rainbow strain in western Oregon (Roaring River) exhibits significantly higher (95 percent C.I.) downstream movement patterns than the commonly stocked strain in Washington (Cape Cod). The value of the loss of recreational days from fish leaving the planted area may exceed $12,900. A conversion of stocking strain from Roaring River to Cape Cod (also demonstrated to result in higher catch rates at 95 percent C.I.) could increase the benefit/cost ratio to 18.0:1.--From abstr.

79-003181 Nara, K.; Shimizu, M.; Okukawa, G.; Matsumura, K.; Umeda, K. [ON THE COHO SALMON TRANSPLANTED FROM NORTH AMERICA INTO THE SHIBETSU RIVER (II).] Sci. Rep. Hokkaido Salmon Hatchery No. 33. p. 7-16. Mar. 1979. In Japanese with English summ. SFA 24(4)

[Hokkaido Salmon Hatchery, Nakanoshima, Toyohiraku, Sapporo, Hokkaido, Japan] Ecological observations in the fry of coho salmon released into four tributaries of the Shibetsu River in 1977 and 1978 were made from July of 1977 to Febrary of 1979. Almost all the coho fry dispersed downward, within a range of 2-3 km, from the released point. In short-cut route and concretepaved bank of the river, fish could not survive on account of high water temperature during the summer of 1978. From June to November, the coho fry mainly feed on aquatic insect larvae. There was no difference between the food of coho and masu salmon fry in the same station. It was obvious that the coho fry needs a specially fixed habitat in winter, which was lost by the improvement of river.

FISHING GEAR AND TECHNIQUES

79-003182 Bass, D. G., Jr.; Hitt, V. G. QUANTITATIVE SAMPLING OF WARM-WATER STREAM FISH WITH DETONATING CORD. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 519-521. 1977[1979]. SFA 24(4)

[Fla. Game Fresh Water Fish Comm., 926 Michigan Ave., Pensacola 32505] Quantitative samples of fish were obtained from warm-water streams with detonating cord. Preliminary results indicate this explosive is an effective tool for fish sampling in streams. Numbers of fish collected per kilometer of stream ranged seasonally from 200 to 473.

79-003183 Gerdeaux, D.; Jestin, J.-M. EXEMPLE D'APPLICATION DU CHALUT ELECTRIFIE DANS UN MILIEU TEMPERE TRES MINERALISE. [AN EXAMPLE OF THE APPLICATION OF AN ELECTRIFIED TRAWL IN A VERY MINERALISED, TEMPERATE ENVIRONMENT.] Ann. Limnol. 14 (3): 281-287. 1978. In French with English summ. SFA 24(4)

[Lab. Zool., Ecol. Norm. Super., 46, rue d'Ulm, 75230 Paris Cedex 05, France] A trawl of small size (mouth 80 cm) was used in a lake of 30 hectares to sample crayfish and fish. The rectified current, controlled by a thyristor, is part of a sine wave with a voltage having a peak lower or equal to 110 volts. The electrification greatly improves the efficiency of the trawl. This non-selective technique gives a good picture of the populations that are sampled.

79-003184 Hewitt, D. P. TESTS TO CONFIRM QUANTITATIVE SAMPLING OF YOUNG FISH BY THE BAGENAL BUOYANT NET. Freshwater Biol. 9 (4): 339-341. Aug. 1979. SFA 24(4)

[Freshwater Biol. Assoc., The Ferry House, Ambleside, Cumbria, LA22 0LP, England] Buoyant nets had been developed and used for several years to sample young fish quantitatively. Tests were carried out to verify the quantitative aspect of sampling. Using nets of 1-m and 0.5-m mouth diameter, over several months, the catches of the two net sizes were compared. There was no significant difference in the lengths of the fish caught in the two sizes of net nor in the population estimates derived from their catches. These results indicate that there is no avoidance of the nets and that they can be considered to sample quantitatively.

79-003185 Honda, K.; Suzuki, M.; Inoue, K.; Isouchi, T. [PROPERTIES OF TOWING ROPE DISUSED AFTER TRAWL FISHING.] Bull. Jpn. Soc. Sci. Fish. 45 (3): 313-321. Mar. 1979. In Japanese with English summ. SFA 24(4)
[Tokyo Univ. Fish., Konan-4, Minato-ku, Tokyo 108, Japan]

79-003186 Hylen, A.; Jakobsen, T. A FISHING EXPERIMENT WITH MULTIFILAMENT, MONOFILAMENT AND MONOTWINE GILL NETS IN LOFOTEN DURING THE SPAWNING SEASON OF ARCTC-NORWEGIAN COD IN 1974. Fiskeridir. Skr. Ser. Havunders. 16 (14): 531-550. 1979. SFA 24(4)
[Inst. Mar. Res., Dir. Fish., Bergen, Norway]

79-003187 Iwasaki, Y. [STUDY ON THE FISHING CONDITION OF YELLOWFIN AND SKIPJACK PURSE SEINE IN THE KINAN AND IZU REGIONS.] Fac. Mar. Sci. Tokai Univ. Collect. Repr. 9: 167-173. 1979. In Japanese with English summ. SFA 24(4)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan]

79-003188 Kawamura, G. [FUNDAMENTAL STUDY ON APPLICATION OF THE VISION OF SPOTTED MACKEREL, /PNEUMATOPHORUS TAPEINOCEPHALUS/ (BLEEKER), TO ANGLING TECHNIQUES--IV RETINAL ADAPTATION OF ANGLED FISH.] Bull. Jpn. Soc. Sci. Fish. 45 (6): 667-671. June 1979. In Japanese with English summ. SFA 24(4)
[Lab. Fish. Technol., Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan] The retinae of spotted mackerel angled were observed histologically, and the underwater illumination was measured in the fishing grounds. The retinae of fish angled at 50-70 m depth in daytime were light adapted, and illumination intensity at the fishing depth was very much higher than that over which retinal adaptation changes. Hence, the vision of these fish might be completely functional when these were angled. The retinae of fish angled under the fish lamp at night showed variety among the individuals and the retinal regions. The state of retinal adaptation seemed to be independent of the duration of lighting. No light adapted retina was found, though the illumination intensity above the mid-water fishing depth was higher than that over which retinal adaptation changes. Hence, it was concluded that the fish attracted to fish lamp had visual acuity much lower than 0.18 and was probably color-blind.

79-003189 Miura, T. [SYSTEMS ENGINEERING APPROACHES TO THE STUDIES OF FISHING GEAR--III. TRAP MODEL EQUIPPED WITH A FUNNEL.] Bull. Jpn. Soc. Sci. Fish. 45 (6): 673-676. June 1979. In Japanese with English summ. SFA 24(4)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

79-003190 Nelson, R. W.; Horak, G. C.; Olson, J. E. WESTERN RESERVOIR AND STREAM HABITAT IMPROVEMENTS HANDBOOK. U.S. Fish Wildl. Serv. FWS/OBS-78/56. 250p. Oct. 1978. SFA 24(4)
[Enviro Control, Inc., 1520 East Mulberry St., Fort Collins, CO 80524]

79-003191 Noor-Hamid, S.; Mardjono, M. AN IMPROVED METHOD OF FRY COLLECTING GEAR. Bull. Shrimp Cult. Res. Cent. (Jepara) 2 (1-2): 194-202. Jan.-July 1976. SFA 24(4)
[Shrimp Cult. Res. Cent., Jepara, Indonesia]

79-003192 Yamane, T. ON THE MOTION OF FISHING GEAR AGAINST WAVE ACTION--II. VERTICAL MOTION OF A FLOAT EXPOSED TO SINE WAVE. Bull. Jpn. Soc. Sci. Fish. 45 (3): 335-339. Mar. 1979. SFA 24(4)
[Fac. Fish., Hokkaido Univ., Hakodate 041, Japan]

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

79-003193 Cole, R. A. ENTRAINMENT AT A ONCE-THROUGH COOLING SYSTEM ON WESTERN LAKE ERIE. VOL. 1. U.S. Environ. Prot. Agency Ecol. Res. Ser. EPA-600/3-78-070. xiii + 140p. July 1978. SFA 24(4)
[Dep. Fish. Wildl., Mich. State Univ., East Lansing 48824] Large enough numbers of certain ichthyoplanktonic species and /Leptodora kindtii/ may be entrained to at least slightly influence population abundances of adult organisms in western Lake Erie. Refined assessments are required to ascertain the degree of effect. The regeneration rates of smaller planktonic organisms in the source waters are likely to negate the local impacts of the cooling system on their populations.--From abstr.

79-003194 Logan, B. E.; Masnik, M. T.; Wilson, J. H. ANALYSIS OF IMPINGEMENT AND FAR-FIELD FISHERIES DATA COLLECTED AT A SOUTH-CENTRAL RESERVOIR. Va. J. Sci. 29 (2): 64. 1978. Abstract only. SFA 24(4)
[U.S. Nuclear Regulatory Comm., Washington, D.C. 20555]

79-003195 Zweiacker, P. J.; Gaw, J. R.; Green, E.; Adams, C. EVALUATION OF AN AIR-BUBBLE CURTAIN TO REDUCE IMPINGEMENT AT AN ELECTRIC GENERATING STATION. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 343-356. 1977[1979]. SFA 24(4)
[Ecol. Serv., Texas Instruments, Inc., P.O. Box 225621, Dallas, TX 75265] A biological testing program was conducted during 1974-75 to determine the efficiency of an air-bubble curtain in reducing fish impingement at Arkansas Nuclear-One Unit 1, on Dardanelle Reservoir, AR. Air curtain operation did not effectively deter fish from entering the intake canal or substantially reduce impingement. Seasonal variations in species composition and length-frequency distribution of impinged fish were independent of air curtain operation. There was a significant inverse correlation between water temperature and impingement levels during fall 1974 and spring 1975. Highest impingement rates occurred during late fall, winter, and early spring, regardless of air curtain status. Impinged individuals were predominantly young-of-the-year-fish, especially threadfin (/Dorosoma petenense/) and gizzard shad (/D. cepedianum/), assumed to be thermally stressed by low (less than 15.5 C) water temperatures.

MATHEMATICS, STATISTICAL METHODS AND MODELING

79-003196 McConnell, K. E.; Sutinen, J. G. BIOECONOMIC MODELS OF MARINE RECREATIONAL FISHING. J. Environ. Econ. Manage. 6 (2): 127-139. June 1979. SFA 24(4)

[Dep. Resour. Econ., Univ. R.I., Kingston 02881] The theory of recreational fishing is developed and conditions are derived for optimal management policy, with special attention given to functional relationships that must be empirically verified. Determinants of the optimal allocation between commercial and recreational fishing effort are derived. The theory is extended to include selected preculiar features of recreational fishing: Some anglers sell their catch; a small proportion of the fishing population accounts for a large proportion of the catch; and anglers throw back a fraction of what they catch. Optimal policies are derived under these more realistic conditions.

LAKE MANAGEMENT & RESEARCH

79-003197 Balon, E. K.; Chadwick, E. M. P. RECLAMATION OF A PERCH LAKE: A CASE STUDY USING DENSITY ESTIMATES AND THE GUILD CONCEPT. Arch. Hydrobiol. 85 (4): 543-547. 1979. SFA 24(4)

[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, CN N1G 2W1, Canada] A conventional density assessment of yellow perch (/Perca flavescens/) in Red Deer Lake by capture-mark-recapture before sampling (rotenone) underestimated the density by nine times and the total production by eight. The largest errors were in the first age group and in the ratio of males to females. The latter was 4:1 in comparison with 1:1 in the rotenone sample. In this 6.2 ha Precambrian shield lake, total production of all six fish species present was 30.8 kg $\text{ha}^{-1}\text{yr}^{-1}$, with 75 percent of it contributed in the first year of life and 71 percent by perch alone. According to the guild concept three of the species, all lithophils, were ecologically unsuccessful, whereas the successful species belonged to less vulnerable guilds. The switch in dominance from brook char (/Salvelinus fontinalis/) to yellow perch was caused by environmental changes induced ten years ago by the beaver.

79-003198 Biro, P. EXPLOITATION OF FISHERY RESOURCES OF LAKE BALATON. Int. Ver. Theor. Agnew. Limnol. Verh. 20 (4): 2146-2149. 1978. SFA 24(4)

[Biol. Res. Inst., H-8237 Tihany, Hungary]

79-003199 Carlander, K. D. FISHERIES AND FISHERIES MANAGEMENT IN RAWA PENING. RESULTS AND PROSPECTS. Proc. Semin. Aquatic Biol. Rawa Pening Lakes, Satya Wacana Christian Univ., Salatiga, Indonesia 1: 77-114. 1978. SFA 24(4)

[Dep. Anim. Ecol., Iowa State Univ., Ames 50010] Systematic sampling of fish markets estimated the yield at 17.8 kg/ha, in 1978, only 10 percent that of 1975. Assumptions of the method need testing but the 2 estimates are comparable. Abundance of water hyacinth, /Eichhornia crassipes/, and floating grass islands were reported to control fish yield in Rawa Pening in 1930s. Recent decline in yield was associated with marked decrease in average sizes of fish indicating overexploitation. Weight-length regression slopes were above 3.0 for /Monopterus albus/, /Clarias batrachus/, /Osteochilus

79-003199 CONTINUED
hasselti/, /Trichogaster pectoralis/, and /Anabas testudineus/, but below 3 for /T. trichopterus/, and about 3 for /Ophiocephalus striatus/. Fecundity of /Osteochilus hasselti/ ranged from 1170-114,000 ova; /Anabas testudineus/, 13,000-18,000; /T. trichopterus/, 450-1250, and a /Clarias/ 1800. Plankton was the major food of the 2 /Trichogaster/, and /Macrobrachium/ shrimp of /A. testudineus/, /O. striatus/, and /C. batrachus/. Fish culture in ponds offers more promise than fisheries in the lake unless fishing intensity can be regulated.

79-003200 Keup, L. E. FISHERIES IN LAKE RESTORATION. Fisheries (Bull. Am. Fish. Soc.) 3 (6): 7-9, 20. Nov.-Dec. 1978. SFA 24(4)
[U.S. EPA, Washington, DC] A three-year-old Environmental Protection Agency program in lake restoration provides matching Federal funds to improve and enhance freshwater lakes. To Date, fisheries scientists have not been active in many of the funded projects. Fisheries personnel need to play a role in the local development and implementation of restoration programs to assure protection and enhancement of a fishery, one of a lake's most important and beneficial uses. Some fish improvement programs would be eligible for fifty percent Federal matching funds.

79-003201 Klessig, L. LAKE DISTRICTS--A UNIQUE ORGANIZATION WITH A SPECIAL PURPOSE. Fisheries (Bull. Am. Fish. Soc.) 3 (6): 10-14. Nov.-Dec. 1978. SFA 24(4)
[Extension Service, Univ. Wis., Madison] This article describes the statutory basis for direct involvement of local property owners in the management of Wisconsin lakes through the creation and operation of a lake district. Although the statute is less than five years old, over 100 communities have begun a management program and several have completed major projects.

79-003202 Lawson, C. S.; Davies, W. D. EFFECTS OF BASS STOCKING AND RATES OF FISHING ON A LARGEMOUTH BASS POPULATION. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 493-497. 1977[1979]. SFA 24(4)
[Ala. Dep. Conserv. Nat. Resour., Div. Game Fish, Montgomery] Supplemental stocking of fingerling and intermediate size largemouth bass (/Micropterus salmoides/) did not provide substantial control of forage fish populations; however, stocking fingerling bass may have improved year class strength in those years they were stocked. Although loss of stocked intermediate-size bass over the spillway was neglibible, those fish were vulnerable to angling. A measured rate of fishing (F = 0.08) was exerted on a population of bass estimated at 22.3 harvestable bass/ha weighing 34 kg/ha.

79-003203 Siddiqui, A. Q. CHANGES IN FISH SPECIES COMPOSITION IN LAKE NAIVASHA, KENYA. Hydrobiologia 64 (2): 131-138. 1 June 1979. SFA 24(4)
[Coll. Agric. Sci. Food, King Faisal Univ., P.O. Box 420, Al-Hassa, Saudi Arabia]

79-003204 Toews, D. R.; Griffith, J. S. EMPIRICAL ESTIMATES OF POTENTIAL FISH YIELD FOR THE LAKE BANGWEULU SYSTEM, ZAMBIA, CENTRAL AFRICA. Trans. Am. Fish. Soc. 108 (3): 241-252. May 1979. SFA 24(4)
[MacLaren Marex, Inc., 1000 Windmill Rd., Dartmouth, NS B3B 1L7, Canada]

79-003205 Weglenska, T.; Dusoge, K.; Ejsmont-Karabin, J.; Spodniewska, I.; Zachwieja, J. EFFECT OF WINTER-KILL AND CHANGING FISH STOCK ON THE BIOCENOSE OF THE POND-TYPE LAKE WARNIAK. Ekol. Pol. 27 (1): 39-70. 1979. SFA 24(4)
[Dep. Hydrobiol., Inst. Ecol., Polish Acad. Sci., Dziekanow (near Warsaw), 05-150 Lomianki, Poland]

RIVER AND STREAM MANAGEMENT & RESEARCH

79-003206 Binns, N. A.; Eiserman, F. M. QUANTIFICATION OF FLUVIAL TROUT HABITAT IN WYOMING. Trans. Am. Fish. Soc. 108 (3): 215-228. May 1979. SFA 24(4)
[Wyo. Game Fish Dep., Cheyenne 82002]

79-003207 Edginton, J.; Larson, R. REVISED ANADROMOUS STREAM CATALOG OF SOUTHEASTERN ALASKA. Alaska Dep. Fish Game Tech. Data Rep. No. 42. 665p. 1979. SFA 24(4)
[Alaska Dep. Fish Game, Ketchikan 99901]

79-003208 Estes, R. D.; Harshbarger, T.; Pardue, G. B. , (compilers) ABSTRACTS OF PAPERS PRESENTED. BROOK TROUT WORKSHOP. Tenn. Coop. Fish. Res. Unit, Tenn. Tech. Univ., Cookeville 44p. Dec. 1978. SFA 24(4)
[U.S. FWS, Coop. Fish. Res. Unit, Tenn. Tech. Univ., Cookeville 38501]

79-003209 Montana Department of Fish and Game INSTREAM FLOW EVALUATION FOR SELECTED STREAMS IN THE UPPER MISSOURI RIVER BASIN. Mont. Dep. Fish Game 254p. 16 Mar. 1979. SFA 24(4)
[1420 E. 6th Ave., Helena 59601]

79-003210 Peterman, L. G. THE ECOLOGICAL IMPLICATIONS OF YELLOWSTONE RIVER FLOW RESERVATIONS. Mont. Dep. Fish Game ix + 70p. May 1979. SFA 24(4)
[Mont. Dep. Fish Game, 1420 E. 6th Ave., Helena 59601]

79-003211 Rascheperin, V. K.; Kochanov, B. T.; Davydov, A. D. TO THE EXPERIMENTS ON REGULATED FISH MANAGEMENT IN THE WATERSHED OF THE SEA OF AZOV. Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 215-217. 1974[1977]. SFA 24(4)
[AzNIIRH, 89a, Stanislavsky St., Rostov-on-Don, USSR]

79-003212 Vincent, D. THE MADISON RIVER: WHAT DOES THE FUTURE HOLD? Mont. Outdoors 10 (4): 31-33. July-Aug. 1979. SFA 24(4)
[305 Yergee Dr., Bozeman, MT 59715]

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT

79-003213 Loker, J. L.; Streit, R. A.; Busch, L. S.; Lubbers, E. L.; Burger, Sr. J. M. PRODUCTIVITY INVESTIGATIONS OF A S.W. KANSAS POND. Trans. Kans. Acad. Sci. 81: 160-161. 1978. Abstract only. SFA 24(4)
[Div. Nat. Sci. Math., Saint Mary of the Plains Coll., Dodge City, KS]

79-003214 Novinger, G. D.; Dillard, J. G. , (eds.) NEW APPROACHES TO THE MANAGEMENT OF SMALL IMPOUNDMENTS. North Cent. Div. Am. Fish. Soc. Spec. Publ. No. 5. 133p. 1978. Available at $3.50 from Don Duerre, Rt. 1, Box 56, Dickson, ND 58601. SFA 24(4)

This publication is a result of the symposium, "Fisheries Management of Small Impoundments: A New Approach," which was sponsored by the North Central Division, American Fisheries Society, at the 38th Midwest Fish and Wildlife Conference in December, 1976. Twelve papers include such topics as sampling efficiency of electrofishing and small seines in ponds later treated with rotenone; factors influencing fish community biomass and population dynamics of largemouth bass (/Micropterus salmoides/) and bluegill (/Lepomis macrochirus/); pond owners' perceptions about management; and "state-of-the-art" papers on the use of smallmouth bass (/Micropterus dolomieui/), Florida largemouth bass (/Micropterus salmoides floridanus/), redear sunfish (/Lepomis microlophus/), and hybrid sunfishes in ponds and small lakes. The authors present a basis and rationale for the use of "Proportional Stock Density" (PSD), proposed as a new index to assess balance in bass-bluegill communities. They also propose a new index of condition for largemouth bass, Relative Weight (W(r)). The papers were written expressly for fisheries management biologists and will be of principal value to small impoundment managers throughout the United States.

LARGE IMPOUNDMENT MANAGEMENT & RESEARCH

79-003215 Champeau, A.; Gregoire, A.; Brun, G. LE PEUPLEMENT PISCICOLE DES LACS ARTIFICIELS DU VERDON. [THE FISH POPULATION OF THE ARTIFICIAL LAKES OF VERDON.] Ann. Limnol. 14 (3): 245-271. 1978. In French with English summ. SFA 24(4)
[Lab. Biol.-Ecol., Univ. Provence I, 1, place Victor-Hugo, 1331 Marseille Cedex 3, France]

79-003216 Hanson, W. D. TAILWATER FISHERIES OF LAKE OF THE OZARKS AND POMME DE TERRE LAKE, MISSOURI. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 505-513. 1977[1979]. SFA 24(4)
[Mo. Dep. Nat. Resour., Columbia 65201] The tailwater fisheries of Lake of the Ozarks and Pomme de Terre Lake were measured by a part-time roving creel survey from 1965 through 1974. Catch rates of fishes were compared with temperature, conductivity and dissolved oxygen, but no significant correlations were found. However, high positive correlations existed at Lake of the Ozarks tailwater between annual average catch rates and the annual average discharge of water, and

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also between preceding mean monthly discharges and following monthly catch rates. There was also a high positive correlation between estimated number of fishes caught in this tailwater and the number of days per year that the flood gates were open. At Pomme de Terre tailwater, there was a high positive correlation between discharge and catch rate for monthly, seasonal, and annual periods. Anglers at the Lake of the Ozarks tailwater had short periods of outstanding angling, longer periods of good fishing and intermittent periods of poor fishing, while anglers at Pomme de Terre tailwater had shorter periods of good success and much longer periods of poor fishing. Manipulation of discharges might prolong and enhance fishing success below dams. Structures that cause deepening of tailwater pools and induce water current eddies would also benefit angler success.

79-003217 Otobo, F. O. THE FISH FAUNA CHANGES AND THE PLACE OF CLUPEIDS IN LAKE KAINJI, NIGERIA. Hydrobiologia 64 (2): 99-103. 1 June 1979. SFA 24(4)
[Kainji Lake Res. Inst., Private Mail Bag 666, New Bussa, Nigeria]

79-003218 Timmons, T. J.; Shelton, W. L.; Davies, W. D. INITIAL FISH POPULATION CHANGES FOLLOWING IMPOUNDMENT OF WEST POINT RESERVOIR, ALABAMA-GEORGIA. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 312-317. 1977[1979]. SFA 24(4)
[Ala. Coop. Fish. Res. Unit, Auburn Univ., Auburn 36830]

ESTUARY MANAGEMENT & RESEARCH

79-003219 Powell, G. L. ESTUARINE FISHERY DYNAMICS AND FRESHWATER INFLOW FLUCTUATIONS IN THE SAN ANTONIO BAY SYSTEMS, TEXAS. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 498-504. 1977[1979]. SFA 24(4)
[Tex. Dep. Water Resour., Environ. Div., Austin 78711] The quantity, quality, and timing of freshwater inflows to the San Antonio bay system are recognized as major factors in fishery production. A methodology has been developed using commercial fishery statistics and gaged inflow records to analyze the fishery dynamics and its relation to freshwater inflows from the contributing river basins. Statistical correlation analysis and assessment of "best" versus "worst" years of production were employed to evaluate the effects of year to year fluctuations in freshwater inflows. Although somewhat rudimentary, the results of the analyses are clear enough to be of practical value for future water resources planning and management. An inflow regime, with a monthly distribution of 1.48×10^5 total annual ha-m of freshwater, is presented that could meet the minimum sustaining requirements of the estuary's fisheries.

79-003220 Shenker, J. M.; Dean, J. M. THE UTILIZATION OF AN INTERTIDAL SALT MARSH CREEK BY LARVAL AND JUVENILE FISHES: ABUNDANCE, DIVERSITY AND TEMPORAL VARIATION. Estuaries 2 (3): 154-163. Sept. 1979. SFA 24(4)
[Acad. Nat. Sci. Phila., Benedict Estuarine Res. Lab., Benedict, MD 20612]

79-003221 Terrell, T. T. PHYSICAL REGIONALIZATION OF COASTAL ECOSYSTEMS OF THE UNITED STATES AND ITS TERRITORIES. U.S. Fish Wildl. Serv. FWS/OBS-78/80. vi + 30p. Mar. 1979. SFA 24(4)
[U.S. FWS, 2625 Redwing Rd., Fort Collins, CO 80526]

MARINE MANAGEMENT & RESEARCH

79-003222 Ayushin, B. N.; Tjurin, A. B. TO THE PROBLEM OF RAISING THE EFFICIENCY OF HERRING REPRODUCTION IN NORTHWEST OKHOTSK SEA BY CREATING ARTIFICIAL SPAWNING GROUNDS. Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 149-156. 1974[1977]. SFA 24(4)
[TINRO, 20, Lenin St., Vladivostok, USSR]

79-003223 Brander, K. M. THE EFFECT OF 200 MILE LIMITS ON FISHERIES MANAGEMENT IN THE NORTHEAST ATLANTIC. FAO Fish. Tech. Pap. No. 183. vii + 19p. 1978. SFA 24(4)
[Fish. Lab., Lowestoft, England] The extension of fishing limits in the Northeast Atlantic has led to a fall in the catches by distant water fleets, but has resolved few of the management problems. This is because most major stocks are shared between coastal states so that bilateral or international agreement is still needed on their management and on the allocation of property rights. The distribution of catches and the migrations of the major stocks are described briefly in order to illustrate the interrelated difficulties of management and allocation which have been encountered. The uses and limitations of bioeconomic models in helping to clarify and resolve these issues are discussed. It is not yet clear what form the new management institutions for the Northeast Atlantic will take and the EEC, whose members are committed to a common fisheries policy, poses special problems. A regional council structure is suggested for providing management advice which takes account of the economic and social needs of the fishing industry as well as the conservation of the stocks.

79-003224 Fadeev, N. S. THE EFFECTIVENESS OF RATIONAL EXPLOITATION OF NATIONAL RESOURCES. Proc. Sov.-Jpn. Joint Symp. Aquacult. 3: 185-193. 1974[1977]. SFA 24(4)
[TINRO, 20, Lenin St., Vladivostok, USSR]

79-003225 FAO of the UN REPORT OF THE NINTH SESSION OF THE ADVISORY COMMITTEE OF EXPERTS ON MARINE RESOURCES RESEARCH. FAO fish. Rep. No. 206. v + 23p. 1978. SFA 24(4)
[Rome, Italy]

79-003226 FAO of the UN REPORT OF THE SEVENTH SESSION OF THE INDIAN OCEAN FISHERY COMMISSION EXECUTIVE COMMITTEE FOR THE IMPLEMENTATION OF THE INTERNATIONAL INDIAN OCEAN FISHERY SURVEY AND DEVELOPMENT PROGRAMME. FAO Fish. Rep. No. 205. v + 15p. July 1978. SFA 24(4)
[Rome, Italy]

79-003227 FAO of the UN REPORT OF THE SECOND SESSION OF THE WESTERN CENTRAL ATLANTIC FISHERY COMMISSION. FAO Fish. Rep. No. 209. vi + 48p. 1978. SFA 24(4)
[Rome, Italy]

79-003228 FAO of the UN REPORT OF THE SECOND SESSION OF THE COMMITTEE ON RESOURCE MANAGEMENT OF THE GENERAL FISHERIES COUNCIL FOR THE MEDITERRANEAN (GFCM). FAO Fish. Rep. No. 207. v + 31p. 1978. SFA 24(4)
[Rome, Italy]

79-003229 FAO of the UN REPORT OF THE JOINT MEETING OF THE WESTERN CENTRAL ATLANTIC FISHERY COMMISSION WORKING PARTY ON ASSESSMENT OF FISH RESOURCES AND WORKING PARTY ON STOCK ASSESSMENT OF SHRIMP AND LOBSTER RESOURCES. FAO Fish. Rep. No. 211. v + 103p. 1978. SFA 24(4)
[Rome, Italy]

79-003230 FAO of the UN SUPPLEMENT 1 TO THE REPORT OF THE NINTH SESSION OF THE ADVISORY COMMITTEE OF EXPERTS ON MARINE RESOURCES RESEARCH. SELECTED WORKING PAPERS SUBMITTED TO THE NINTH SESSION OF ACMRR. FAO Fish. Rep. No. 206(suppl. 1). v + 56p. 1978. SFA 24(4)
[Rome, Italy]

79-003231 Holt, S. EXCESS CAPACITY AND APPROPRIATE GEAR: THE CASE OF THE CALIFORNIA SWORDFISH FISHERY. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 458-473. 1978. SFA 24(4)
[Mar. Res. Econ., Univ. Calif., Santa Cruz]

79-003232 Huppert, D. D. IMPLICATIONS OF MULTIPURPOSE FLEETS AND MIXED STOCKS FOR CONTROL POLICIES. J. Fish. Res. Board Can. 36 (7): 845-854. July 1979. In English with French summ. SFA 24(4)
[NMFS, Southwest Fish. Cent., La Jolla, CA 92038]

79-003233 Kaczynski, W. RESPONSES AND ADJUSTMENTS OF FOREIGN FLEETS TO CONTROLS IMPOSED BY COASTAL NATIONS. J. Fish. Res. Board Can. 36 (7): 800-810. July 1979. In English with French summ. SFA 24(4)
[Inst. Mar. Stud., Univ. Wash., Seattle 98195]

79-003234 King, D. M. MEASURING THE ECONOMIC VALUE OF THE EASTERN TROPICAL PACIFIC TUNA FISHERY. Proc. Annu. Conf. West. Assoc. Fish Wildl. Agencies 58: 444-457. 1978. SFA 24(4)
[NMFS, Southwest Fish. Cent., La Jolla CA 92038]

79-003235 Kurenkov, I. I. [PACIFIC SALMON STOCK CONDITION AND SOME PROBLEMS OF THEIR ABUNDANCE RESTORATION.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 2: 59-73. 1973[1977]. In Russian. SFA 24(4)
[TINRO, 20, Lenin St., Vladivostok, USSR]

79-003236 Leitzell, T. L. FISHERIES MANAGEMENT UNDER THE FISHERY CONSERVATION AND MANAGEMENT ACT (FCMA). Fisheries (Bull. Am. Fish. Soc.) 4 (1): 34-36. Jan.-Feb. 1979. SFA 24(4)

79-003237 Low, R. A., Jr. VARIABILITY IN OCEAN FISHING SUCCESS FOR SALMON (/ONCORHYNCHUS/ SPP.) OFF WASHINGTON AND VANCOUVER ISLAND AND ITS RELATIONSHIP WITH INSIDE RUN STRENGTH. Ph.D. dissertation, Univ. Wash. 269p. 1979. From Diss. Abstr. Int. B Sci. Eng. 40(2):511. Aug. 1979. SFA 24(4)

79-003238 Lucas, K. THE 200-MILE ZONE: CANADA'S NEW FRONTIER. Fisheries (Bull. Am. Fish. Soc.) 4 (1): 27-31. Jan.-Feb. 1979. SFA 24(4)

79-003239 MacKenzie, W. C. RATIONAL FISHERY MANAGEMENT IN A DEPRESSED REGION: THE ATLANTIC GROUNDFISHERY. J. Fish. Res. Board Can. 36 (7): 811-826. July 1979. In English with French summ. SFA 24(4)
[Dep. Fish. Oceans, Fish. Prices Support Bd., Ottawa, ON K1A 0E6, Canada]

79-003240 Matlock, G. C.; Weaver, J. E.; Green, A. W. TRENDS IN SPOTTED SEATROUT AND RED DRUM ABUNDANCE IN TEXAS COASTAL WATERS INFLUENCED BY COMMERCIAL NETTING ACTIVITIES. Proc. Annu. Conf. Southeast. Assoc. Fish Wildl. Agencies 31: 477-483. 1977[1979]. SFA 24(4)
[Tex. Parks Wildl. Dep., Coastal Fish. Br., 4200 Smith School Rd., Austin 78744] Spotted seatrout (/Cynoscion nebulosus/) and red drum (/Sciaenops ocellata/) populations in Texas bays were randomly sampled with 183 m long gill nets November 1975 through March 1976 and November 1976 through March 1977. Catch rates in areas closed to commercial netting for spotted seatrout were about twice as high as those from areas open to netting. There was no difference between the mean total length of spotted seatrout from closed areas and trout from open areas. Closed areas produced about twice as many red drum as open areas. No generalization could be made about the size of red drum and whether they were caught in open or closed areas. Apparently, the effect of commercial netting on these species is local. When spotted seatrout and red drum are removed from netted areas, populations in adjacent non netted areas are not appreciably affected. Both species are apparently capable of sustaining their populations when subjected to limited commercial netting unless adverse environmental conditions exist.

79-003241 May, R. M.; Beddington, J. R.; Clark, C. W.; Holt, S. J.; Laws, R. M. MANAGEMENT OF MULTISPECIES FISHERIES. Science 205 (4403): 267-277. 20 July 1979. SFA 24(4)
[Biol. Dep., Princeton Univ., Princeton, NJ 08540] With the overexploitation of many conventional fish stocks, and growing interest in harvesting new kinds of food from the sea, there is increasing need for managers of fisheries to take account of interactions among species. In particular, as Antarctic krill-fishing industries grow, there is a need to agree upon sound principles for managing the Southern Ocean ecosystem. Using simple models, we discuss the way multispecies food webs respond to the harvesting of species at different trophic levels. These biological and economic insights are applied to a discussion of fisheries in the Southern Ocean and the North Sea and to enunciate some general principles for harvesting in

79-003241 CONTINUED
multispecies systems.

79-003242 McGoodwin, J. R. THE DECLINE OF MEXICO'S PACIFIC INSHORE FISHERIES. Oceanus 22 (2): 51-59. 1979. SFA 24(4)
[Woods Hole Oceanogr. Inst., Woods Hole, MA]

79-003243 Messieh, S. N.; Cote, G.; Boulva, J. LA PECHE DU HARENG DE GASPE. [THE HERRING FISHERY IN THE GASPE.] Nat. Can. (Que.) 106 (1): 255-276. Jan.-Feb. 1979. In French with English summ. SFA 24(4)
[Fish. Oceans Can., Fish. Mar. Serv., Biol. Stn., St. Andrews, NB, Canada] Examination of the biological characteristics of herring caught in the Gaspe area showed that the fishery is based on aggregations of different herring populations. These populations differed in length and age composition, growth, maturation, spawning time and fecundity. Local herring populations inhabit the bays along the Gaspe coast, and provide local inshore fisheries. However, the major fishery is concentrated on the banks off the Gaspe. These areas provide major feeding grounds for herring migrating from the southern Gulf of St. Lawrence and as far as southwest Newfoundland. The importance of the highly productive area of the Gaspe Peninsula in herring feeding migration is discussed.

79-003244 Moiseev, P. A. [SOME WAYS OF INCREASING THE WORLD OCEAN BIOPRODUCTIVITY.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 2: 7-18. 1973[1977]. In Russian. SFA 24(4)
[VNIRO, 17 Krasnoselskaya, Moscow B-140, USSR]

79-003245 Ogawa, Y. [PROBLEMS OF ARTIFICIAL REEFS FOR PROPAGATION OF FISH IN SHALLOW WATER.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 1: 83-91. 1972[1977]. In Japanese with English summ. SFA 24(4)
[Tokai Reg. Fish. Res. Lab., Fish. Agency, Tokyo, Japan]

79-003246 Pearse, P. H.; Wilen, J. E. IMPACT OF CANADA'S PACIFIC SALMON FLEET CONTROL PROGRAM. J. Fish. Res. Board Can. 36 (7): 764-769. July 1979. In English with French summ. SFA 24(4)
[Dep. Econo., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

79-003247 Rafful, L. F. MEXICO'S 200-MILE EXCLUSIVE FISHERIES ZONE. Fisheries (Bull. Am. Fish. Soc.) 4 (1): 32-33. Jan.-Feb. 1979. SFA 24(4)

79-003248 Rass, T. S. [THEORETICAL PREREQUISITES AND PROSPECTS FOR THE INTEROCEANIC TRANSPLANTATION OF THE PACIFIC AND THE ATLANTIC OCEAN FISH SPECIES.] Proc. Sov.-Jpn. Joint Symp. Aquacult. 2: 19-28. 1973[1977]. In Russian. SFA 24(4)
[Inst. Oceanol., Acad. Sci. USSR, 1, Sadovaya, Ljublinc, Moscow J-387, USSR]

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[Fac. Mar. Sci. Technol., Tokai Univ., Japan]

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Mexico: Baja California
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Mexico: Gulf of California
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Mexico: Rio Grande River
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Michigan
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Michigan: Big Garlic River
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Michigan: Lake Superior
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Minnesota
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Minnesota: Meeker Cty.: Lake Erie
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Minnesota: Minnesota River
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Minnesota: Wright Cty.: Lake Mary
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Mississippi: Strong River
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Missouri
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Missouri: Big River
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Missouri: Lake of the Ozarks
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Missouri, Northwestern
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Missouri: Osage River Basin
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Missouri: Pomme de Terre Lake
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79-002019

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Montana: Colstrip
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Montana: Madison River
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Montana: Missouri River Basin
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Montana: Rosebud Creek
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Montana: Yellowstone River
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Nebraska: Brown Cty.: Bone Creek
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Nebraska: McConaughy Reservoir
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Nebraska: North Platte River
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Nevada: Virgin River
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New Hampshire: Bellamy River
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New Hampshire: Great Bay Estuary
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New Hampshire: Johnson Creek
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New Hampshire: Oyster River
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New Jersey
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New Jersey: Delaware River
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New Mexico
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New Mexico: Pecos River
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New York: Fire Island Inlet
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New York: Oneida Lake
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New York: State Barge Canal
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New Zealand
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New Zealand: Hen Island
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New Zealand: Mathias River
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New Zealand: South Westland
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New Zealand: Wainuiomata River
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Nicaragua: Lake Jiloa
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Nigeria: Benue River
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Nigeria: Swashi River
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North Carolina: Cape Fear River
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North Carolina: Carteret Cty.
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North Carolina: Lake Norman
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North Carolina: Onslow Bay
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North Dakota: Benson Cty.: Wood Lake
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North Dakota: Lake Sakakawea
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North Dakota: Sheyenne River
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Ohio: Champaign Cty.: Anderson Creek
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Ohio: Lucas Cty.
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Ohio: Ottawa River
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Ohio: Portage Cty.
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Ohio: Portage River
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Ohio: Richmond Cty.: Cedar Fork Creek
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Ohio: Salt Creek
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Ohio: Wayne Natl. For.
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Ohio: West Twin Lake
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Oklahoma
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Oklahoma: Arbuckle Lake
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Oklahoma: Lake Carl Blackwell
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Oklahoma: Logan Cty.: Cimarron River
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Pacific Ocean: Hawaii

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Pacific Ocean: Japan
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Pacific Ocean: Oregon
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Pennsylvania: Bushkill Creek
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Pennsylvania: Conococheague Creek
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Pennsylvania: Dauphin Cty.: Lake Frederic
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Pennsylvania: Montgomery Cty.
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Pennsylvania: Northampton Cty.: Saucon Creek
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Pennsylvania: Perry Cty.: Sherman Creek
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Pennsylvania: Schuylkill River
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Pennsylvania: Susquehanna River
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Pennsylvania: Washington Cty.: Buffalo Creek
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Poland
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Poland: Lake Warniak
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South Carolina: Lake Keowee
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South Carolina: North Edisto River Estuary
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South Carolina: Santee-Cooper
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South Dakota
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South Dakota: Brule Creek
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South Dakota: Little Missouri River
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South Dakota: Missouri River
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South Dakota: Sioux Falls River Park
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Tennessee: Blackburn Fork
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Tennessee: Center Hill Reservoir
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Tennessee: Clinch River
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Tennessee: Cumberland River
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Tennessee: Melton Hill Reservoir
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Tennessee: New River Basin
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Tennessee: Old Hickory Reservoir
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Tennessee: Pickwick Reservoir
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Tennessee: Sequatchie River
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Texas: Bexar Cty.
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Texas: Big Sandy Creek
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Texas: Cedar Bayou Electric Generating Stn.
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Texas: Gulf of Mexico
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Texas: Lake Bastrop
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Texas: San Antonio Bay
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Texas: Sheldon Reservoir
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Texas: Trinidad Lake
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USSR: Iriklinskoye Reservoir
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USSR: Syrdarja River
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Utah: Bear Lake
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Wisconsin: Portage Cty.: Buena Vista Marsh
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79-000480
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79-000492
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Parasites/Diseases - Anemia
79-001403
79-001863
Parasites/Diseases - Anisakinae
79-002252
Parasites/Diseases - Anisakis
79-001397 79-002257
Parasites/Diseases - Bacterial Diseases
79-000523
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Parasites/Diseases - Bacterial Kidney Disease
79-000528
Parasites/Diseases - Balanotaeniidae
79-000547
Parasites/Diseases - Black Spot Disease
79-000537
Parasites/Diseases - Bluegill Virus
79-002988
Parasites/Diseases - Bomolochus concinnus
79-000539
Parasites/Diseases - Bothriocephalus cuspidatus
79-001400
Parasites/Diseases - Botulism
79-002978
Parasites/Diseases - Bucephalopsis karvei
79-000543
Parasites/Diseases - Cardiodectes medusaeus
79-001408
Parasites/Diseases - Cataracts
79-001415
Parasites/Diseases - CCVD
79-000535
79-001388
79-001390
79-002245
Parasites/Diseases - Cestodes
79-000538
79-000540
79-000541
79-000547
79-000555
79-001399

Parasites/Diseases.............continued
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79-001407
79-001412
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79-002254
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79-002989
Parasites/Diseases - Chloromyxum truttae
79-000532
Parasites/Diseases - Ciguatera
79-003004
Parasites/Diseases - Clavellodes macrotrachelus
79-002258
Parasites/Diseases - Clostridium botulinum
79-002978
Parasites/Diseases - Cod-Worm
79-002990
Parasites/Diseases - Colobomatus labracis
79-003000
Parasites/Diseases - Contracaecum
79-001420
79-001421
Parasites/Diseases - Corallotaenia minutia
79-000555
Parasites/Diseases - Cryptobia salmositica
79-002242
Parasites/Diseases - Cryptocotyle lingua
79-002272
Parasites/Diseases - Cystidicola cristivomeri
79-000363
Parasites/Diseases - Cystidicola farionis
79-001418
Parasites/Diseases - Dichelyne bullocki
79-001405
Parasites/Diseases - Dinemoleus indeprensus
79-000542
Parasites/Diseases - Diphyllobothrium
79-002277
Parasites/Diseases - Diphyllobothrium dendriticum
79-002989
Parasites/Diseases - Diploproctodaeum plicitum
79-001422
Parasites/Diseases - Diplostomum spathaceum
79-001414
79-002263
Parasites/Diseases - Diplozoon nipponicum
79-001403
Parasites/Diseases - Disease-Free Culture
79-002965
Parasites/Diseases - Dropsy
79-001396
Parasites/Diseases - Duplicibothrium minutum
79-001423
Parasites/Diseases - Echinorhynchus
79-000552
Parasites/Diseases - Enteric Redmouth Disease
79-002972
Parasites/Diseases - Epistylis
79-000524
79-000529
79-002986
Parasites/Diseases - Ergasilus manicatus
79-000539
Parasites/Diseases - Eubacterium
79-000525
Parasites/Diseases - Eubothrium salvelini
79-002254
Parasites/Diseases - Fin Rot
79-002238
Parasites/Diseases - Flexibacter
79-002973
Parasites/Diseases - Flexibacter columnaris
79-000523
Parasites/Diseases - Fungal Diseases
79-002979
79-002980
Parasites/Diseases - Galactosomum phalacrocoracis
79-000554
Parasites/Diseases - Gas Bubble Disease
79-000074
79-000553
79-001410
79-002267
Parasites/Diseases - Gastrocotyle trachuri
79-002269
Parasites/Diseases - Genarchopis goppo
79-000548
Parasites/Diseases - General
79-000080
79-000516
79-000518
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79-001364
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79-002970
Parasites/Diseases - General/Connecticut
79-002968
Parasites/Diseases - General/France
79-002229
Parasites/Diseases - General/Yugoslavia
79-002920
Parasites/Diseases - Gill Parasites
79-001404
79-002230
79-002250
79-002269
Parasites/Diseases - Gracilisentis gracilisentis
79-002995
Parasites/Diseases - Grillotia dollfusi
79-000541
Parasites/Diseases - Gyrodactylus salaris
79-001401
Parasites/Diseases - Haemogregarina sachai
79-002241
Parasites/Diseases - Haliotrema kurodai
79-001411
Parasites/Diseases - Hatschekia plectropomi
79-000544
Parasites/Diseases - Helminths
79-000551
79-001416
79-002966
79-002997
Parasites/Diseases - Hematozoa
79-002984
Parasites/Diseases - Hemorrhagic septicemia
79-002974
Parasites/Diseases - Henneguya
79-002981
Parasites/Diseases - Henneguya adiposa
79-002983
Parasites/Diseases - Horricauda rhinobatidis
79-001404
Parasites/Diseases - IHN
79-001387
Parasites/Diseases - Immune Response
79-000517
79-002233
79-002971
Parasites/Diseases - Immunization
79-000517
79-001363
79-002236
79-002976
Parasites/Diseases - Interniloculus chilensis
79-003002
Parasites/Diseases - IPN
79-000536
79-002244
79-002247
79-002248
Parasites/Diseases - Isoglaridacris wisconsinensis
79-002274
Parasites/Diseases - Leeches

79-000545
79-001392
Parasites/Diseases - Lepeophtheirus
79-002260
Parasites/Diseases - Lernaea cyprinacaea
79-002256
Parasites/Diseases - Lernaea cyprinacea
79-001394
79-002262
Parasites/Diseases - Lernaeenicus radiatus
79-003003
Parasites/Diseases - Lernaeocera branchialis
79-001419
Parasites/Diseases - Lissorchis hypentelii
79-002273
Parasites/Diseases - Lissorchis kritskyi
79-002251
Parasites/diseases - Lymphocystis
79-001386
Parasites/Diseases - Meningitis
79-000525
Parasites/Diseases - Mugilicola
79-001402
Parasites/Diseases - Muscle Necrosis
79-001398
Parasites/Diseases - Mycobacterium
79-000527
Parasites/Diseases - Myxidium truttae
79-000532
Parasites/Diseases - Myxobolus
79-000530
Parasites/Diseases - Myxosoma cerebralis
79-000533
79-000534
79-001384
79-001385
79-002987
Parasites/Diseases - Myxosporida
79-000530
Parasites/Diseases - Neascus pyriformis
79-002261
Parasites/Diseases - Nematodes
79-000363
79-000556
79-000557
79-001395
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79-001405
79-001420
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79-002257
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79-002991
79-002996
Parasites/Diseases - Neoechinorhynchus saginatus
79-001409
Parasites/Diseases - Nephrocalcinosis
79-002992

Parasites/Diseases - Nutritional Diseases
  79-001415
  79-001699
Parasites/Diseases - Oceanobdella sexoculata
  79-000545
Parasites/Diseases - Parasitic Copepods
  79-000539
  79-000542
  79-000544
  79-001394
  79-001402
  79-001408
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  79-002256
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  79-002271
  79-003000
  79-003003
Parasites/Diseases - Parasitic Isopods
  79-002276
Parasites/Diseases - Paravitellotrema overstreeti
  79-002255
Parasites/Diseases - Penarchigetes fessus
  79-002275
Parasites/Diseases - Philometroides huronensis
  79-000556
Parasites/Diseases - Phocanema decipiens
  79-002990
Parasites/Diseases - Phocascaris
  79-002270
Parasites/Diseases - Piscine Erythrocytic Necrosis
  79-001391
Parasites/Diseases - Pomphorhynchus laevis
  79-000546
Parasites/Diseases - Proleptus mackenziei
  79-000557
Parasites/Diseases - Proliferative Kidney Disease
  79-000531
Parasites/Diseases - Proteocephalus
  79-000538
Parasites/Diseases - Protozoan Diseases
  79-000524
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  79-002981
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Parasites/Diseases - Pseudodactylogyrus microrchis
  79-002265
Parasites/Diseases - Pseudomonas
  79-002235
Parasites/Diseases - Pseudomonas anguilliseptica
  79-002237
Parasites/Diseases - Pseudomonas fluorescens
  79-002974
Parasites/Diseases - Pseudomonas reptilivora
  79-000526
Parasites/Diseases - Pseudonicothoe branchialis
  79-002250
Parasites/Diseases - Pseudophyllidae
  79-002259
Parasites/Diseases - Red-sore Disease
  79-000524
  79-000529
Parasites/Diseases - Red-Spot Disease
  79-002237
Parasites/Diseases - Rhabdochona catostomi
  79-002996
Parasites/Diseases - Saprolegnia diclina
  79-002980
Parasites/Diseases - Sarcocystis
  79-001383
Parasites/Diseases - Sclerocollum rubrimaris
  79-001417
Parasites/Diseases - Spruce budworm Nuclear Polyhedrosis Virus
  79-002246
Parasites/Diseases - Streptococcus
  79-001375
  79-002975
Parasites/Diseases - Tergestia karachiense
  79-002253
Parasites/Diseases - Thyroid Hyperplasia
  79-003001
Parasites/Diseases - Transversotrema patialense
  79-002998
Parasites/Diseases - Trematodes
  79-000537
  79-000543
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  79-000554
  79-001401
  79-001403
  79-001404
  79-001406

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79-001422
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79-002998
79-002999
79-003002
Parasites/Diseases - Trichlorfon
79-002265
Parasites/Diseases - Troglocephalus rhinobatidis
79-001404
Parasites/Diseases - Trypanoplasma salmositica
79-002243
Parasites/Diseases - Trypanosoma catostomi
79-002982
Parasites/Diseases - Trypanosoma cobitis
79-002985
Parasites/Diseases - Trypanosomes
79-002984
Parasites/Diseases - Tuberculosis
79-000527
Parasites/Diseases - Tumors
79-000558
79-001393
79-001413
79-002268
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79-002993
79-002994
Parasites/Diseases - Ulcers
79-001376
Parasites/Diseases - Uvulifer
79-000537
Parasites/Diseases - Vibrio
79-001376
79-002235
Parasites/Diseases - Vibrio anguillarum
79-001374
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79-002239
Parasites/Diseases - Vibriosis
79-001374
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79-002977
Parasites/Diseases - Viral Diseases
79-000535
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79-002244
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Parasites/Diseases - Whirling Disease
79-000533
79-000534
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79-001385
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Parasites/Diseases - Yersinia ruckeri
79-002972
Physiology - Acoustico-Lateralis System
79-000117
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79-001806
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79-001820
Physiology - Actomyosins
79-001113
Physiology - Adenosine
79-002641
Physiology - Aestivation
79-002629
Physiology - Air Breathing
79-001039
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79-001889
79-002606
79-002707
79-002719
Physiology - Alarm Substances
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Physiology - Amino Acids
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79-000970
79-000992
79-001019
79-001897
79-002721
79-002726
Physiology - Anoxia
79-000994
Physiology - Antifreeze Production
79-000282
79-001009
Physiology - Ascorbic Acid
79-000087
79-000865
79-001006
79-001118
79-002669
Physiology - ATP
79-001012
79-001013
79-001067
79-001075
79-001932
Physiology - ATPase
79-000626
79-002622
Physiology - Biochemical Composition
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79-000185
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79-000250

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Physiology - Bioenergetics
79-000273
79-001770
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79-001814
Physiology - Bioluminescense
79-000973
Physiology - Blood Chemistry
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79-002963
Physiology - Body Temperature
79-000998
79-001070
Physiology - Cadmium
79-000296
Physiology - Calcium
79-000083
79-000279
79-001013
Physiology - Calorific Values
79-000965
Physiology - Cardio-Vascular System
79-000196
79-000267
79-000958
79-000993
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79-001901
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79-002641
79-002652
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79-002701
Physiology - Catecholamines
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79-001034
79-002675
79-002712
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79-001870
79-002628
Physiology - Cell Culture
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Physiology - Cement Glands
79-001002
Physiology - Cesium
79-001030
Physiology - Chloride Cells
79-002705
Physiology - Coloration
79-000137
79-001797
79-002642
Physiology - Corpuscle of Stannius
79-001874
Physiology - Corticosteroids
79-002691
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Physiology - Cortisol
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79-002718
Physiology - Decompression
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Physiology - Digestion Rates
79-001227
79-001237
79-001679
79-001812
79-001813
79-001890
79-002678
Physiology - Digestive System
79-000169
79-000256
79-000301
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79-002660
79-002670
Physiology - Digestive System/Bacterial Flora
79-001824
79-001902
79-002733
Physiology - DNA
79-000954
Physiology - Early Development
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79-001198
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79-002662
Physiology - Electric Organs
79-000222
79-000238
79-000247
79-000293
79-001033
Physiology - Electrophoresis
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Physiology - Electrophysiology
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Physiology - Electroreception
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79-001786
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Physiology - Electroshock
79-000183
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79-001109
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Physiology - Excretory System
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79-002704
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79-002726
Physiology - Fertilization
79-001818
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Physiology - Growth Stimulants
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Physiology - Hemoproteins
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Physiology - Iron
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Physiology - Lactate Dehydrogenase
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Physiology - Lactate Levels
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- Toxicology - Kepone
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  - 79-000595
- Toxicology - Kerosene
  - 79-002352
- Toxicology - Lead
  - 79-000601
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  - 79-001500
  - 79-002354
  - 79-002355
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  - 79-002375
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- Toxicology - Lead Nitrate
  - 79-001488
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- Toxicology - Malachite Green
  - 79-001830
- Toxicology - Malathion
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- Toxicology - Masoten
  - 79-003077
- Toxicology - MCPA
  - 79-003057
- Toxicology - Mercuric Chloride
  - 79-001489
  - 79-001490
- Toxicology - Mercury
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  - 79-003043
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- Toxicology - Methallibure
  - 79-000609
- Toxicology - Methylene Chloride
  - 79-000590
- Toxicology - Mine Effluents
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  - 79-002281
- Toxicology - Mirex
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- Toxicology - MS-222
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  - 79-002329
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- Toxicology - Naphthalene
  - 79-000593
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- Toxicology - Nickel
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Water Use/Conservation - Watershed Management
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LIST OF PUBLICATIONS SCREENED

The following publications were screened for Volume 24. Publications not included on this list are irregularly published papers or separates from publications not regularly received by the Morgan Library of Colorado State University or this editorial office.

Acta Agriculturae Scandinavica
Acta Biotheoretica
Acta Hydrochimica et Hydrobiologica
Acta Parasitologica Polonica
Acta Pathologica et Microbiologica Scandinavica Section A Pathology
Acta Pathologica et Microbiologica Scandinavica Section B Microbiology
Acta Pharmacologica et Toxicologica
Acta Physiologica Scandinavica
Acta Protozoologica
Acta Virologica
Acta Zoologica (Sweden)
Acta Zoologica Fennica
Advances in Anatomy, Embryology and Cell Biology
Alabama Conservation
Alaska Department of Fish and Game Informational Leaflet
Alaska Department of Fish and Game Technical Data Reports
Alaska Fish Tales & Game Trails
Ambio
American Journal of Anatomy
American Journal of Physiology
American Journal of Science
American Midland Naturalist
American Museum Novitates
American Naturalist
American Scientist
American Zoologist
Animal Behavior
Animal Learning and Behavior
Animal Regulation Studies
Annales de Biologie Animale Biochemie Biophysique
Annales de Genetique et al Selection Animale
Annales d'hydrobiologie
Annales L'Institut Oceanographique
Annales de Limnologie
Annales des Sciences Naturelles Zoologie et Biologie Animale
Annales of the South African Museum
Annales de Zoologie Ecologie Animale
Annales de Zootechnie
Annals of Applied Biology
Annals of the Cape Provincial Museums Natural History
Annals of Tropical Medicine and Parasitology
Annotationes Zoologicae Japonenses
Annual Proceedings of the Texas Chapter of the American Fisheries Society
Applied Animal Ethology
Applied and Environmental Microbiology
Aquaculture
Archiv fur Fischereiwissenschaft
Archiv fur Hydrobiologie
Archiv fur Hydrobiologie Supplementband
Archiv fur Tierernaehrung
Archives de Biologie
Archives of Environmental Contamination and Toxicology
Archives of Toxicology
Archives de Zoologie Experimentale et Generale
Arctic
Arctic and Alpine Research
Arkansas Game and Fish
Astarte

Australian Journal of Biological Science
Australian Journal of Marine and Freshwater Research
Australian Journal of Zoology
Australian Zoologist
Bamidgeh
Bangladesh Journal of Scientific and Industrial Research
Behavioral Biology
Behavioral Ecology and Sociobiology
Behavioral and Neural Biology
Behaviour
Bijdragen tot de Dierkunde
Biochemical Genetics
Biochemical and Systematic Ecology
Biochimica et Biophysica Acta
Biologia
Biological Bulletin
Biological Conservation
Biological Journal of the Linnean Society
Biological Reviews of the Cambridge Philosophical Society
Biologisches Zentralblatt
Biologist
Biology of Reproduction
Biometrics
Bios
Bioscience
Biosystems
Biotechnology and Bioengineering
Biotropica
Brimleyana
Bulletin of the Alabama Museum of Natural History
Bulletin of the American Museum of Natural History
Bulletin of the British Museum (Natural History) Zoology
Bulletin of the Ecological Society of America
Bulletin of Environmental Contamination and Toxicology
Bulletin of Experimental Biology and Medicine
Bulletin of the Faculty of Fisheries Hokkaido University
Bulletin of the Fisheries Research Board of Canada
Bulletin of the Japanese Society of Scientific Fisheries
Bulletin of Marine Science
Bulletin of Mathematical Biology
Bulletin of the Museum of Comparative Zoology
Bulletin of the Shrimp Culture Research Center (Jepara)
Bulletin de lo Societe Zoologique de France
Bulletin of the South Carolina Academy of Science
Bulletin of the Southern California Academy of Science
California Academy of Science Occasional Papers
California Cooperative Oceanic Fisheries Investigations Reports
California Department of Fish and Game Fish Bulletins
California Fish and Game
Cal-Neva Wildlife Transactions
Canadian Field-Naturalist
Canadian Journal of Behavioral Science
Canadian Journal of Zoology
Cell and Tissue Research
Ciencia e Pratica
Ciencias Marinas
Clinical Toxicology
Coastal Zone Management Journal
Colorado Outdoors
Commercial Fish Farmer
Comparative Biochemistry and Physiology A Comparative Physiology
Comparative Biochemistry and Physiology B Comparative Biochemistry
Comparative Biochemistry and Physiology C Comparative Pharmacology
Comptes Rendus Hebdomadaires des Seances de l'Academie des Sciences Naturelles
Comptes Rendus des Seances de la Societe de Biologie et de ses Filiales
Conservationist
Contributions in Marine Science
Copeia
Critical Reviews in Environmental Control

Critical Reviews in Toxicology
Cryobiology
Deep-Sea Research
Delaware Conservation
Developmental Biology
Dissertation Abstracts International B Science and Engineering
Doklady Biological Sciences
Dynamics of Atmospheres and Oceans
Ecological Law Quarterly
Ecological Modelling
Ecological Monographs
Ecology
Ekologia Polska
Endocrinology
Environmental Affairs
Environmental Conservation
Environmental Law
Environmental Management
Environmental Planning
Environmental Pollution
Environmental Research
Environmental Science and Technology
Estuaries
Evolution
Experientia
Experimental Parasitology
FAO Fisheries Reports
FAO Fisheries Technical Paper
Fieldiana Zoology
Fish Disease Leaflets
Fish Distribution Report
Fish Farming International
Fisheries
Fisheries and Environment Canada Fisheries and Marine Service Technical Reports
Fishery Bulletin
Fisheries Research Board of Canada Miscellaneous Special Publications
Fisheries Research Technical Report of the Ministry of Agriculture, Fisheries and Food
Fisken og Havet
Fiskeridirektoratets Skrifter Serie Havundersokelser
Florida Scientist
Florida Wildlife
Freshwater Biology
General and Comparative Endocrinology
Genetics
Georgia Journal of Science
Great Basin Naturalist
Great Lakes Fishery Commission Technical Reports
Heredity
Hydrobiologia
Hydrobiological Bulletin
Illinois Natural History Survey Bulletin
Indian Journal of Animal Science
Indian Journal of Environmental Health
International Journal of Parasitology
International Journal of Radiation Biology
International Pacific Halibut Commission Scientific Report
International Pacific Halibut Commission Technical Report
Investigations in Fish Control
Iowa Conservationist
Iowa State Journal of Research
Israel Journal of Zoology
Japanese Journal of Applied Entomology and Zoology
Japanese Journal of Ecology
Japanese Journal of Genetics
Japanese Journal of Limnology
Journal of the Acoustical Society of America
Journal of the Alabama Academy of Sciences
Journal of Anatomy
Journal of Animal Ecology
Journal of Animal Morphology and Physiology

Journal of Animal Physiology and Animal Nutrition
Journal of Applied Ecology
Journal of the Arizona Academy of Science
Journal of Biogeography
Journal of the Bombay Natural History Society
Journal of the Colorado-Wyoming Academy of Sciences
Journal of Comparative Ethology
Journal of Comparative Physiology A Sensory, Neural, and Behavioral Physiology
Journal of Comparative Physiology B Metabolic Transport Functions
Journal of Ecology
Journal of the Elisha Mitchell Scientific Society
Journal of Embryology and Experimental Morphology
Journal of Endocrinology
Journal of Environmental Economics and Management
Journal of Environmental Management
Journal of Environmental Pathology and Toxicology
Journal of Environmental Quality
Journal of Environmental Science
Journal of Environmental Science and Health A Environmental Science and Engineering
Journal of Environmental Science and Health B Pesticides, Food Contamination and Agricultural Wastes
Journal of Environmental Systems
Journal of Experimental Biology
Journal of Experimental Marine Biology and Ecology
Journal of Experimental Zoology
Journal of the Faculty of Fisheries and Animal Husbandry Hiroshima University
Journal of the Faculty of Marine Science and Technology Tokai University
Journal of Fish Biology
Journal of the Fisheries Research Board of Canada
Journal of General Physiology
Journal of General Virology
Journal of Great Lakes Research
Journal of Helminthology
Journal of Hydrology
Journal of Ichthyology
Journal of the Idaho Academy of Science
Journal of the Inland Fisheries Society of India
Journal of the Marine Biological Association of the United Kingdom
Journal of Marine Research
Journal of Marine Science
Journal of Mathematical Biology
Journal of the Minnesota Academy of Science
Journal of the Mississippi Academy of Science
Journal of Morphology
Journal of Natural History
Journal of Nematology
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Journal of Theoretical Biology
Journal of Thermal Biology
Journal of Toxicology and Environmental Health
Journal of Virology
Journal of the Washington Academy of Science
Journal of the Water Pollution Control Federation
Journal of Wildlife Disease
Journal of Wildlife Management
Journal of Zoology
Lammergeyer
Libyan Journal of Science

Life Sciences
Limnologica
Limnology and Oceanography
Louisiana Conservationist
Louisiana Wildlife and Fisheries Commission Technical Bulletin
Maine Fish and Wildlife
Malayan Applied Biology
Malayan Nature Journal
Marine Biology
Marine Fisheries Review
Marine Pollution Bulletin
Maryland Conservationist
Massachusetts Wildlife
Masters Abstracts
Mauri Ora
Meddelelser fra Danmarles Fiskeri-og Havundirsogelser
Michigan Department of Natural Resources Fishery Research Report
Michigan Natural Resources
Micronesica
Minnesota Volunteer
Minnesota Department of Natural Resources Section of Fisheries Investigational Reports
Mississippi Game and Fish
Missouri Conservationist
Montana Outdoors
Moscow University Biological Science Bulletin
National Parks and Conservation Magazine
Natural History
Naturaliste Canadien
Nature
Nature Canada
Nebraskaland
Nematologica
Netherlands Journal of Zoology
New Hampshire Fish and Game Department Survey Report
New Hampshire Natural Resources
New Jersey Outdoors
New Mexico Academy of Science Bulletin
New Mexico Wildlife
New York Fish and Game Journal
New Zealand Journal of Marine and Freshwater Research
New Zealand Journal of Science
New Zealand Journal of Zoology
New Zealand Ministry of Agriculture and Fisheries Fisheries Research Bulletin
New Zealand Ministry of Agriculture and Fisheries Fisheries Technical Report
NOAA Technical Report NMFS Circular
NOAA Technical Report NMFS SSRF
Norsk Institutt for Vannforskning
North Dakota Outdoors
Northeast Gulf Science
Northwest Science
Occasional Papers of the Museum of Texas Tech University
Occasional Papers of the Museum of Zoology, University of Michigan
Oceanology
Oceans
Oceanus
Oecologica
Ohio Fish and Wildlife Report
Ohio Journal of Science
Oikos
Ontario Fish and Wildlife Review
Oregon Wildlife
Outdoor Arizona
Outdoor California
Outdoors in Georgia
Outdoor Oklahoma
Pacific Science
Pacific Search
Parasitology
Pesticide Biochemistry and Physiology

Pesticide Science
Pharmacology, Biochemistry and Behavior
Philippine Journal of Fisheries
Philosophical Transactions of the Royal Society London B Biological Sciences
Physiological Zoology
Physiology and Behavior
Piscator
Prairie Naturalist
Proceedings of the American Society of Civil Engineer, Journal of the Environmental Engineering Division
Proceedings of the Annual Conference of the Southeast Association of Game and Fish Commissioners
Proceedings of the Annual Conference of the Western Association of State Game and Fish Commissioners
Proceedings of the Annual Meeting World Mariculture Society
Proceedings of the Arkansas Academy of Science
Proceedings of the Biological Society of Washington
Proceedings of the California Academy of Science
Proceedings of the Helminthological Society of Washington
Proceedings of the Indian Academy of Science Section A
Proceedings of the Indiana Academy of Science
Proceedings of the International Association of Fish and Wildlife Agencies
Proceedings of the Iowa Academy of Science
Proceedings of the Japan Academy B Physical and Biological Science
Proceedings of the Louisiana Academy of Science
Proceedings of the Montana Academy of Science
Proceedings of the National Academy of Science
Proceedings of the Nebraska Academy of Sciences and Affiliated Societies
Proceedings of the North Dakota Academy of Science
Proceedings of the Oklahoma Academy of Science
Proceedings of the Pennsylvania Academy of Science
Proceedings of the Rochester Academy of Science Inc.
Proceedings of the Royal Society of Edenburgh Section B Biological Science
Proceedings of the Royal Society of London B Biological Sciences
Proceedings of the Society of Experimental Biology and Medicine
Proceedings of the Soviet-Japanese Joint Symposium on Aquaculture
Proceedings of the South Dakota Academy of Science
Proceedings of the West Virginia Academy of Science
Progressive Fish-Culturist
Quarterly Review of Biology
Report of the Institute of Freshwater Research of Drottingholm
Revista Iberica de Parasitólogia
Revue Suisse de Zoologie
Rivista Italianadi Piscicoltura e Ittiopatologia
Royal Ontario Museum Life Sciences Contributions
Royal Ontario Museum Life Sciences Occasional Papers
Sarsia
Science
Science of the Total Environment
Scientia Sinica
Scientific American
Scientific Reports of the Hokkaido Salmon Hatchery
Scottish Fisheries Bulletin
Scottish Fisheries Information Pamphlet
Scottish Fisheries Research Report
Seckenbergiana Biologica
South African Association for Marine Biological Research Investigational Report
South Carolina Marine Resources Center Technical Report
South Carolina Wildlife
South Dakota Conservation Digest
Southwestern Naturalist
Soviet Journal of Developmental Biology
Soviet Journal of Ecology
Swiss Journal of Hydrology
Systematic Zoology
Tennessee Wildlife
Texas Journal of Science
Texas Parks and Wildlife

Thaiassographica
Theoretical Population Biology
Toxicology
Toxicology and Applied Pharmacology
Toxicon
Transactions of the American Fisheries Society
Transactions of the American Microscopical Society
Transactions of the Illinois State Academy of Science
Transactions of the Kansas Academy of Science
Transactions of the Kentucky Academy of Science
Transactions of the Missouri Academy of Science
Transactions of the Nebraska Academy of Science
Transactions of the North American Wildlife and Natural Resources Conference
Transactions of the San Diego Society of Natural History
Transactions of the Zoological Society of London
Travaux Sur Les Pecheries du Quebec
Tropical Ecology
Tulane Studies in Zoology and Botany
Underwater Naturalist
Unesco Technical Papers in Marine Science
U.S. Environmental Protection Agency Ecological Research Series
U.S. Environmental Protection Agency Environmental Monitoring Series
U.S. Environmental Protection Agency Star Series
U.S. Fish and Wildlife Service Research Reports
U.S. Fish and Wildlife Service Resource Publications
U.S. Fish and Wildlife Service Technical Papers
Victoria Fisheries and Wildlife Papers
Virginia Journal of Science
Virginia Wildlife
Washington Wildlife
Wassmann Journal of Biology
Water, Air, and Soil Pollution
Water Research
Water Resources Bulletin
Water Resources Research
Western Australia Department of Fisheries and Wildlife Reports
Western Australia Marine Research Laboratory Fishery Research Bulletin
Wildlife in North Carolina
Wisconsin Department of Natural Resources Fish Management Report
Wisconsin Department of Natural Resources Research Report
Wisconsin Department of Natural Resources Technical Bulletin
Wisconsin Natural Resources
Wonderful West Virginia
Wyoming Wildlife
Xenobiotica
Zeitschrift fuer Parasitenkunde
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Zoologica Scripta
Zoologica Journal of the Linnean Society
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March 3, 1849

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